The NEW IMPROVED Poor Man's JAMES BOND

Kurt Saxon

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ORIGINAL POOR MAN'S
JAMES BOND, REVISED,
CORRECTED, ENLARGED

ULTIMATE BOOBYTRAP

POTASSIUM CYANIDE

FULL AUTO CONVERSION:
AR-15, MARK 1, MINI-14,
STEN GUN

FIREWORKS & EXPLOSIVES
LIKE GRANDDAD USED
TO MAKE

EXPLOSIVES, MATCHES,
& FIREWORKS

PYROTECHNY-WEINGART

AMERICAN PYROTECHNIST

WE SHALL FIGHT
IN THE STREETS

ARSON BY ELECTRONICS

U.S. MARINES & ARMY
HAND-TO-HAND COMBAT

The NEW IMPROVED Poor Man's JAMES BOND

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Kurt Saxon

YOU ARE THE LAW!

by Kurt Saxon

Due to budget cuts a Missouri sheriff's department closes down at 5 pm. Callers get a recorded message saying, in effect, "Defend yourself as best you can until tomorrow".

Violent crime rose 12% in 1986.

Prisons are so crowded, thousands of criminal psychotics are given early parole. Cases of murder, rape and every other vicious crime have been reported as a direct result of loosing these animals.

Mental institutions are so selective that an applicant has to prove his eligibility by killing at least one of the examiners. The fellow who killed 21 McDonald's customers a couple of years ago had been refused mental help just a few days previous to the massacre because he seemed in pretty good shape, all things considered.

Most police agencies are understaffed, overworked and their officers prone to battle fatigue. It is increasingly hard to get a collar put away for the period determined by his offense. Officers often ignore crimes they feel our Liberal courts would allow to be plea-bargained out of the over-crowded docket. There are even cases of cops ignoring a mugging while staked out for a large drug bust. So you can actually be attacked, robbed, raped, maimed or killed while a cop looks on.

Drugs have become such a fixation with our lawmen that their suppression has effectively emasculated police sworn to "Protect and Serve". Besides, every cop who makes a drug bust is, in effect, working for the drug dealers. Their valiant, though counterproductive efforts serve only to drive up the prices of drugs. This greatly increases your chance of being mugged or burglarized by losers needing more money for a fix.

The only solution to the drug problem is total legalization. This would take the profit from the trade. The losers who prey on society to support their habit could then destroy their already inferior brains at little cost and no danger to the taxpayer.

Why should billions be taken from our economy by the Drug Enforcement Agency, junkies robbing to support their habit and court time? Who cares if a loser, born to no purpose, destroys his brain? Wouldn't your child be less likely to get on drugs through peer pressure if one of his already hooked peers had nothing to gain? And wouldn't you rather a junky blow his mind with over-the-counter narcotics than maim or kill you or one of your loved ones for the money to buy from a pusher?

Our great-grandparents could buy any narcotic over-the-counter. Drug-induced crimes were too rare to document. Drug addicts not only had no need to prey on society to support their habit but they soon died, taking their inferior selves out of the gene pool.

Now, babies are born showing withdrawal symptoms. Hundreds of thousands of degenerates are breeding like rats, both out of ignorance and to get more Aid to Dependent Children so as to buy more drugs.

The Secret Secret Agent's Lab!

Just imagine you were the real 007. After saving your country a dozen times, you are in disgrace. This is is because, at a party, you gave the queen a playful goose, causing her to spring into the punch bowl. So you were fired.

No longer the clever gadgets, the fancy and lethal cars. And all those girls? Now even Moneypenny won't give you a tumble. Poor baby.

But you've still got all those enemies you've made during so many movies. You are now cut off from MI-5 and on your own. Now you'll have to equip yourself to survive and defend your nation. Unauthorized and even forbidden to engage the foe, you must keep your activities secret from police, landlords and especially relatives living with you.

Of course, while making all your own weapons, you'll need a cover story to explain your workshop and lab. Aside from the other volumes of THE POOR MAN'S JAMES BOND, I advise you to get GRANDDAD'S WONDERFUL BOOK OF CHEMISTRY and all the volumes of THE SURVIVOR. With all this information, you will be able to create an arsenal while leading others to think you were only trying out the old formulas and crafts.

Although the chemistry book shows how to make many compounds from simple, easy to get chemicals, you may want to order many chemicals and lab

This was exemplified on a recent Phil Donahue show. The stage was crowded with cribs of "boarder babies". These were the pitiful offspring of junkies who were too far gone to care for their socially doomed young. "What to do about the situation?" was the theme of the segment.

Somehow, a rational caller got through who said that all their mothers should undergo mandatory sterilization. Phil moved on without addressing himself to the only realistic solution suggested. Nor did any in his audience refer to it. Both Phil and his entire studio audience seemed to believe that something should be done to help those ruined children. Of course, nothing could be done, but preventing more of the same was out of the question.

So more women will have more ruined babies. They will also spread AIDS through dirty needles and prostitution and have more babies while Phil and his Liberal audience yammer their impotent sympathy.

But I digress. Getting back to the subject of you, the private citizen being the law, is my purpose.

Not too long ago, officers engaged in public relations would lecture civilians on how to keep from being injured by social predators. Their advice was non-resistance. "Give him what he wants and he may not hurt you".

This no longer holds true. Increasingly, more predators are those prematurely released from nuthouses and prisons. They are criminally psychotic and consider the bodily injury of their victims the icing on their cake. They have no fear of punishment since they are used to prison or have papers saying they are mentally ill and so are not responsible. So why shouldn't they tear you to pieces after they've gotten your wallet or raped you?

One argument against resistance to the mugger, armed robber or rapist is that a show of counter-force might make him mad at you. But, Dear Heart, is not a monster threatening your life already mad at you?

This brings to mind a classic news account of a rape, before the word "rape" was in common use. "He beat her up, knocked her teeth out, threw her downstairs, breaking her leg, and then attacked her".

Getting back to your being the law; you've heard of the term "Citizen's Arrest". This means that a citizen witnessing a crime where there are no police present is legally empowered to arrest the lawbreaker. Such arrests have only been made in the case of non-violent offenders. I've never heard of a mugger or rapist being treated to a citizen's arrest. Even so, if the citizen making the arrest failed to "read him his rights" would not he be released?

So forget citizen's arrests. Also, don't be bothered by any objections to taking the law into your own hands. When you are confronted by an assailant you are the law. Moreover, in anticipation of being forced to act against an attacker, go armed.

With your chances of being a victim going up all the time, the penalties for carrying a concealed weapon become less important. Even so, as a California police captain told me years ago, "Better to be judged by twelve than carried by six". Besides, if you aren't accustomed to being searched, how would carrying a concealed weapon make you more likely to be searched?

As the crime rate rises, the Liberal media continues to intimidate the citizen who would exercise his duty to eliminate predators. Bernhard Goetz is still being tried for shooting four vermin. Berny's only crimes were in not killing them all and in then giving himself up.

A lesser crime was in his pleading self-defense. I hate that term. If you limit your action to defense, which he didn't, an attacker can break through your defense. The idea is to attack with the intention to maim or kill your attacker.

What most people don't realize is that a mugger, rapist, burglar, etc., chooses his victims for their vulnerability. He's not a challenger. He doesn't want any resis-supplies ready-made. Your best source is the hobby chemical companies advertizing in the classifieds of Popular Science and Popular Mechanics.

Of course, such companies have removed just about all of the oxidizers like the chlorates and nitrates, plus acids and anything else a child may do damage with. But they do offer the full range of lab equipment such as rubber tubing, glass tubing, retorts, flasks, test tubes, etc., that you may not want to take the trouble to make yourself.

An even better source for chemicals is your local pharmacy. It would be best if it was one near a hospital, as they usually have more chemicals in stock, such as strong ammonia, formaldehyde, etc.

You don't just walk up to the pharmacist with a list of chemicals and lab gear. Most of his time is spent filling prescriptions and he makes a good living at it. He would make a profit ordering chemicals and lab gear for you but not enough to interrupt his routine. So you have to be very clever and get to his ego and also his unorthodox interests.

Every pharmacist is somewhat of a mad scientist in his own fantasies. You must get him to accept your own interest in weird projects without arousing any suspicion or taking up too much of his time.

You start by saying a few cheery words to him on a couple of occasions when you see he's not too busy. Most pharmacists are really nice guys but if he's just an old poop, go on to the next one.

Your best bet is to show him a copy of GRANDDAD's WONDERFUL BOOK OF CHEMISTRY, especially the section on chemical magic. Tell him you are interested in stage magic with chemicals but don't know how to get the chemicals. You may even loan him the book. At any rate, it will be your best smokescreen, giving you a legitimate, if odd, excuse for wanting just about any chemical you feel a need for.

tance. A counterattack is usually the only way to keep from being victimized. And that usually means any form of counterattack.

A predator bent on gain from someone he considers weaker will change his mind quickly if attacked by his victim. After all, he doesn't want to press charges against a victim. Nor does he want to explain a wound which has to be reported to the police. In most cases, he simply can't afford resistance to any degree.

Even so, the media still warns against counterforce against attackers. Last week a Little Rock TV station did a report against stun guns by Doug Hurst. The argument was that the stun gun wasn't effective against everyone and it would take about three seconds to immobilize an attacker, the inference being that the attacker could disarm a smaller person in those three seconds.

That was nonsense. Anyone unaffected by 50,000 volts is from another planet. Even a 35,000 volt stun gun will stop an attacker instantly. And sure, one can do a lot in three seconds. But the stun gun immobilizes instantly and the longer the contact is maintained, the longer the attacker will be immobilized. So simple contact will make an attacker helpless. If the contact is maintained for from three to five seconds, the attacker will be paralyzed for from four to eight minutes. In that time you can handcuff him and take his wallet. (Spoils of war).

One thing to keep in mind is to never threaten a mugger or any other attacker. Use on him whatever you have. In most cases he would run. But if your weapon seems puny or if he has a longer reach, you might not be able to do as much damage to him as if you take him unawares.

Actually, any harm you can do to an attacker will be very likely to cause him to flee. We're not concerned with "stopping power" here. Stopping power usually applies to an assailant dedicated to harming you as an individual. He may be a doped-up psycho bent on rape or mayhem for its own sake. In that event you might as well do as much damage as you can since you are at risk regardless of your behavior.

In most cases concerning junkies, they are not high. They want money for a fix and are hurting. They don't want any more pain. A .22 Stinger, a stab wound from a knife pen or even a "Key Buddy" knife will be sufficient.

Last week I was gratified by a caller who told me I may have saved the lives of his wife and himself. He told me they were in a foreign country and were accosted by a knife-wielding punk who demanded their money. The caller had one of my fangs in a narrow pocket he had had his wife sew beside his wallet pocket. The fang pocket was snug enough to retain the cap as the fang was withdrawn.

The caller removed the wallet and fang at the same time and as he handed over the wallet he shoved the potassium cyanide loaded fang into the punk's stomach.

As expected, it had registered in the fool's mind that something had been done to him. He paused momentarily to see if he was hurt. The caller estimated that it took only from four to six seconds for him to drop dead. As it happened, police were nearby and took the body away, assuming the robber had had a heart attack. The caller wasn't held.

But the caller was sure, from the demeanor of the punk, that had he not been fanged he would have stabbed them both. The police were there only by coincidence.

Aside from being able to destroy vermin who might be a threat to you, you ought to reach out as a responsible protector of your community. If you are at loose ends, you ought to become a cop. Failing that, there is always the National Guard. At least join your local neighborhood watch. Without a sense of community responsibility you won't count for much in the long run.

A sure way to get lab gear and even a pretty fair assortment of chemicals is to call up highschool and college chemistry lab teachers, after class, Tell them you are looking for second-hand lab gear and would appreciate it if they would tell you if they knew of any graduating students who might wish to part with their old lab gear. I've come upon good buys from ex-chemistry students who were through with their equipment. It's usually just taking up space and they are glad to get rid of it for very little.

Teachers are often very helpful on behalf of such students and also, one might even have some school lab gear that has been replaced with new equipment. You might also ask the teachers where to buy lab gear and chemicals.

Another way is to put an ad in your local newspaper's classifieds under "Wanted". Example, "Wanted: Beginning chemistry student wants second hand lab gear and chemicals. (phone)". You might also tack such an ad on highschool and college bulletin boards.

If you put your mind to it you can gradually accumulate all the lab gear and chemicals you want. But just to prepare you for the time when you may have to make your own lab gear you should learn to make all the practical lab gear you can from odds and ends.

The following calls for a lot of glass and rubber tubing which is easy to get from any pharmacy or chemistry catalogue. Even so, copper tubing in various sizes from your local hardware store can often be substituted for glass tubing. Most glass tubing is used for leads from stoppers to which rubber or plastic tubing is attached. To bend copper tubing without crinkling, you fill the tubing with sand.

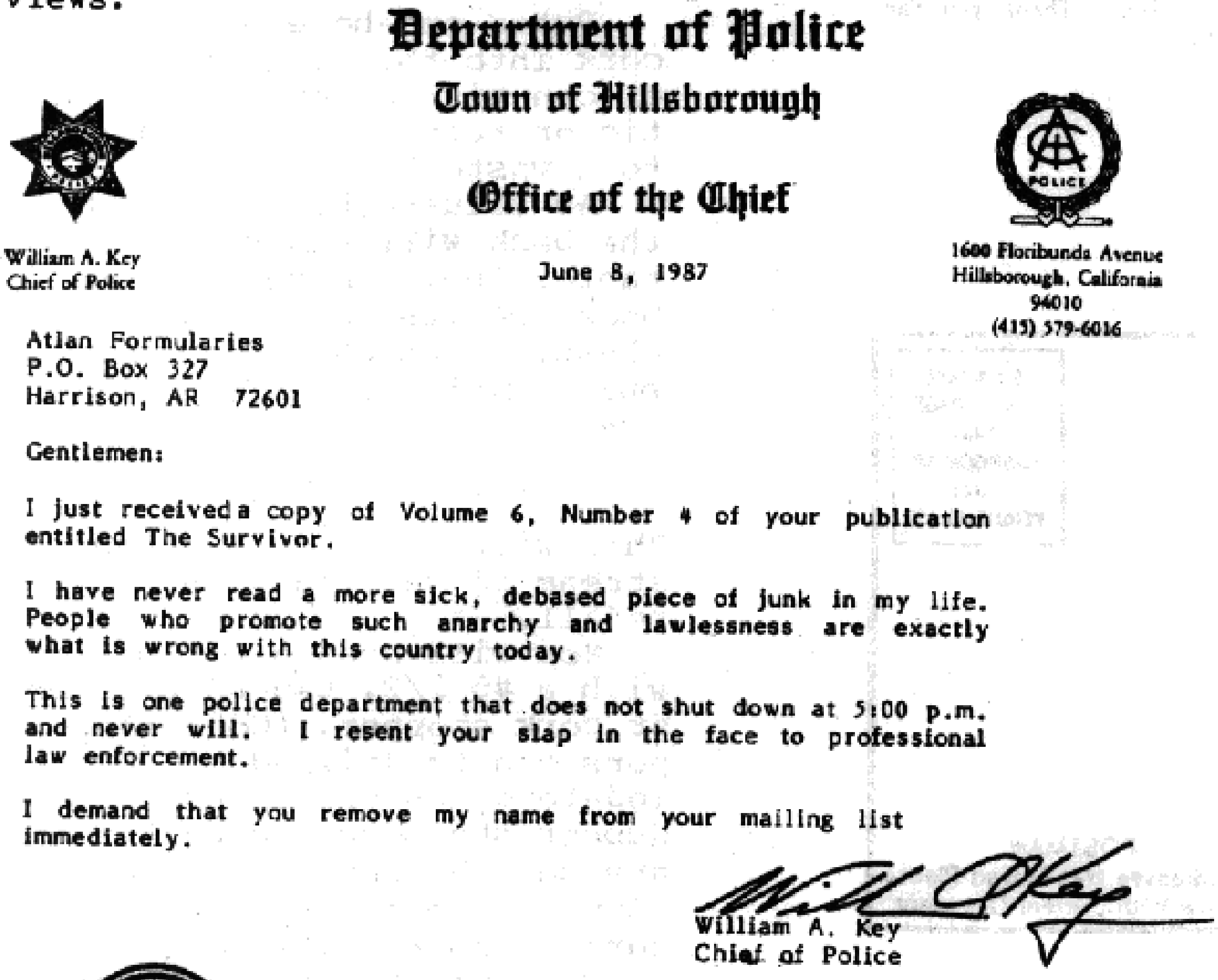
Regular corks of all sizes can be bought from any large hardware store. The cork is drilled to snugly accommodate glass or copper tubing.

Plastic tubing can also be bought from the same hardware store in all sizes. It is al-

COPS TURN THUMBS DOWN ON INTELLIGENCE

by Kurt Saxon

In my last editorial I stressed the fact that as our system degenerates, the police will be even less able to protect the public. It was not an anti-police article. However, even though the police are increasingly unable to protect the public, they were greatly offended by my views.



Department of Police
Town of Hillsborough
Office of the Chief

William A. Key
Chief of Police

1600 Floribunda Avenue
Hillsborough, California
94010
(415) 579-6016

June 8, 1987

Atlan Formularies
P.O. Box 327
Harrison, AR 72601

Gentlemen:

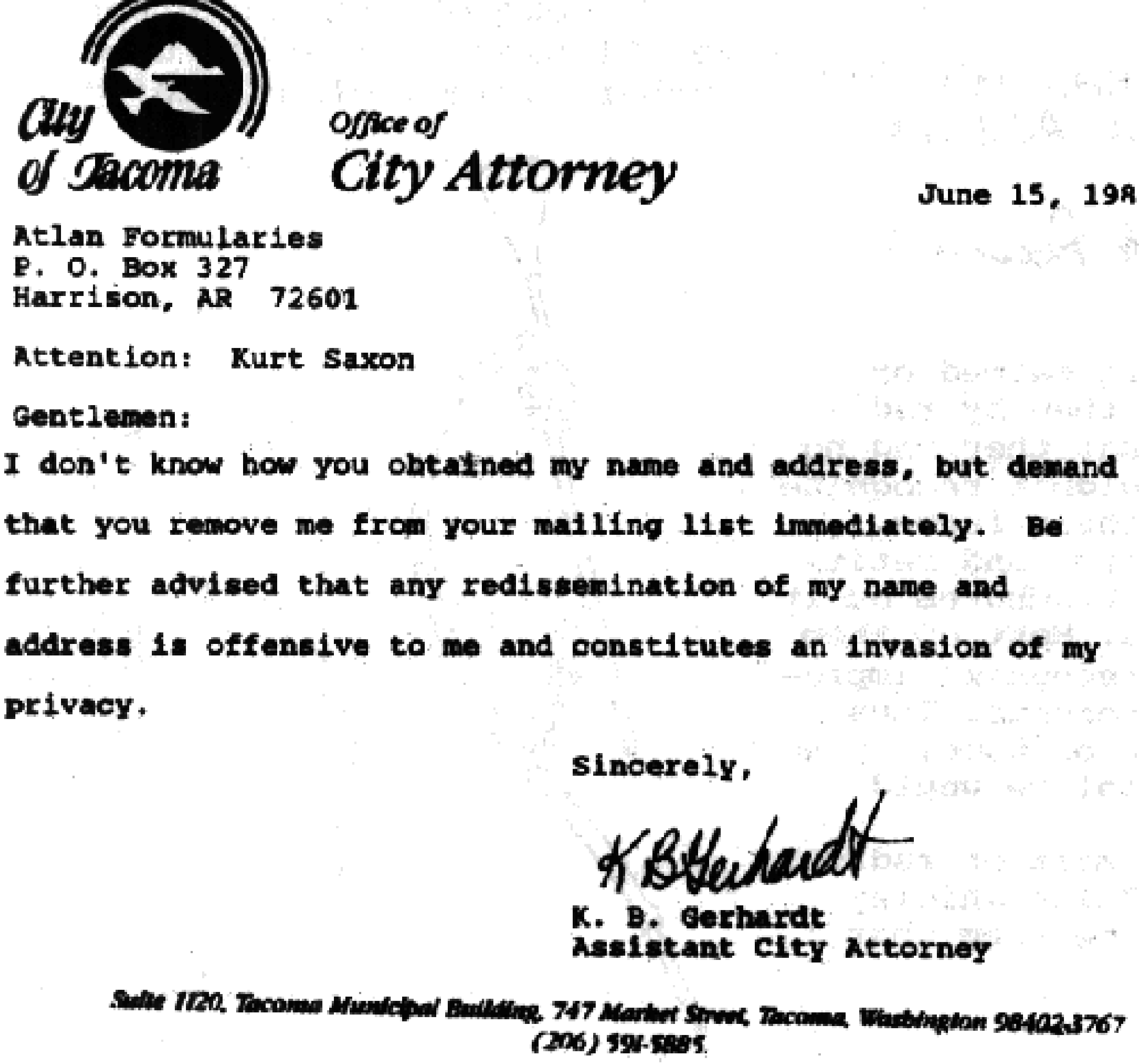
I just received a copy of Volume 6, Number 4 of your publication entitled The Survivor.

I have never read a more sick, debased piece of junk in my life. People who promote such anarchy and lawlessness are exactly what is wrong with this country today.

This is one police department that does not shut down at 5:00 p.m. and never will. I resent your slap in the face to professional law enforcement.

I demand that you remove my name from your mailing list immediately.

William A. Key
Chief of Police



City of Tacoma
Office of City Attorney

June 15, 1987

Atlan Formularies
P. O. Box 327
Harrison, AR 72601

Attention: Kurt Saxon

Gentlemen:

I don't know how you obtained my name and address, but demand that you remove me from your mailing list immediately. Be further advised that any redissemination of my name and address is offensive to me and constitutes an invasion of my privacy.

Sincerely,

K. B. Gerhardt
Assistant City Attorney

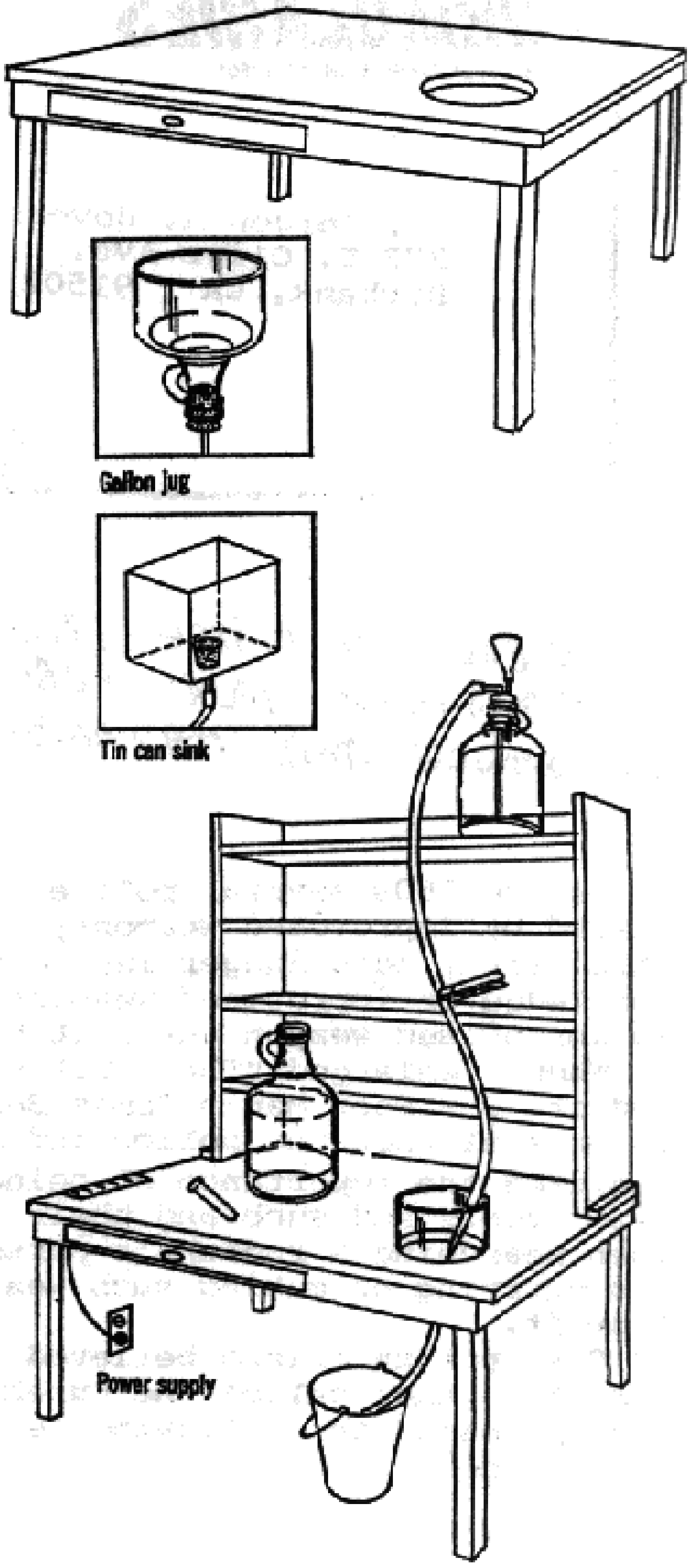
Suite 1120, Tacoma Municipal Building, 747 Market Street, Tacoma, Washington 98402-3767
(206) 591-5885

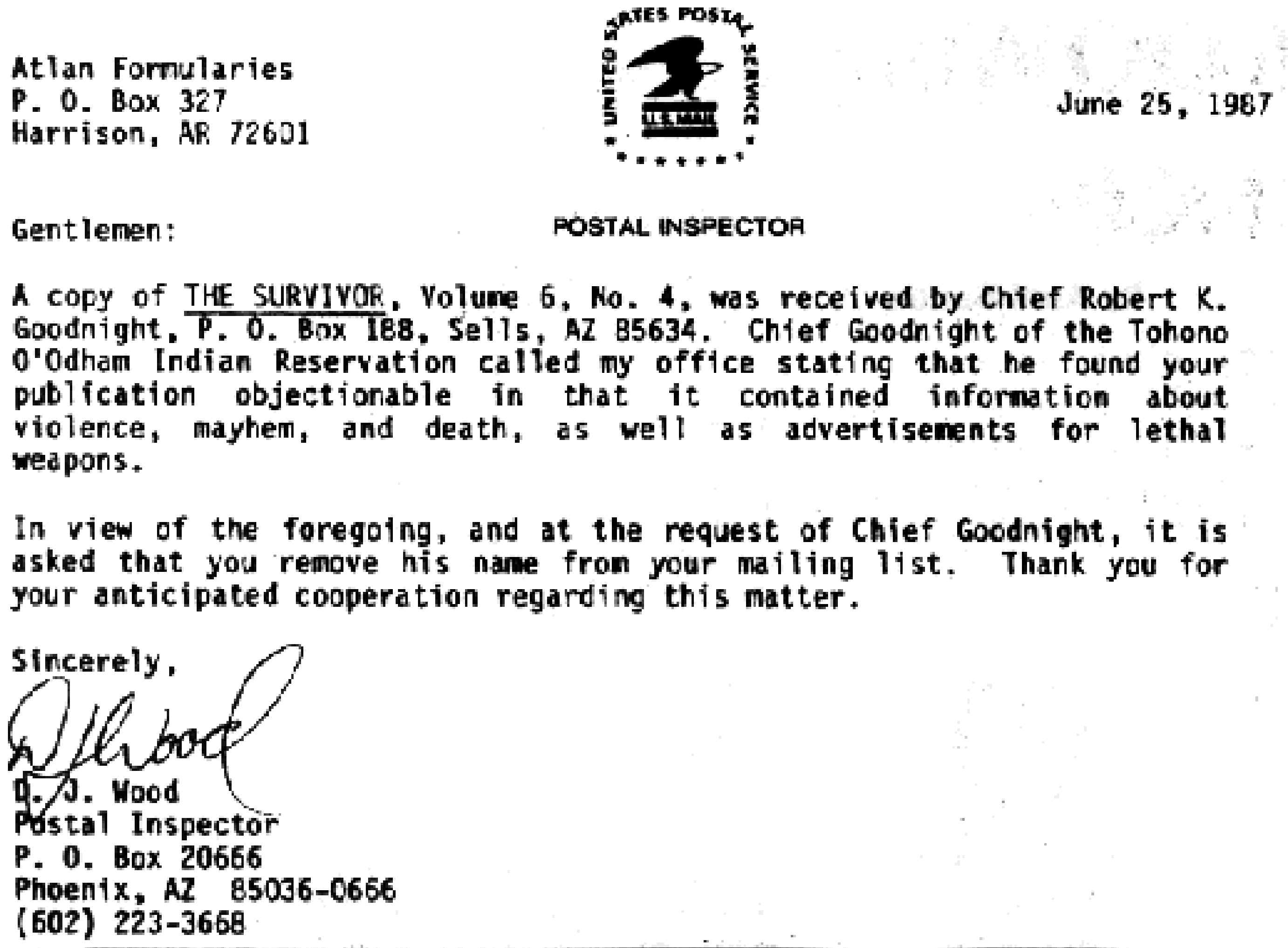
most as good as rubber tubing but tends to go limp with any heat. This can be remedied by tying a string around the drooping section and suspending it up away from the heat.

WORK TABLE

You can't properly organize your projects without a suitable work table. Any old table will do as long as it's sturdy so it doesn't wobble. You can get such a table very cheaply from your local junk shop, Good Will or Salvation Army store.

You'll need a round hole in the table to accommodate the top half of a gallon jug used as a sink. You can also use an oblong gallon can. If a jug, make the hole slightly smaller than the diameter of





Atlan Formularies
P. O. Box 327
Harrison, AR 72601

POSTAL INSPECTOR

June 25, 1987

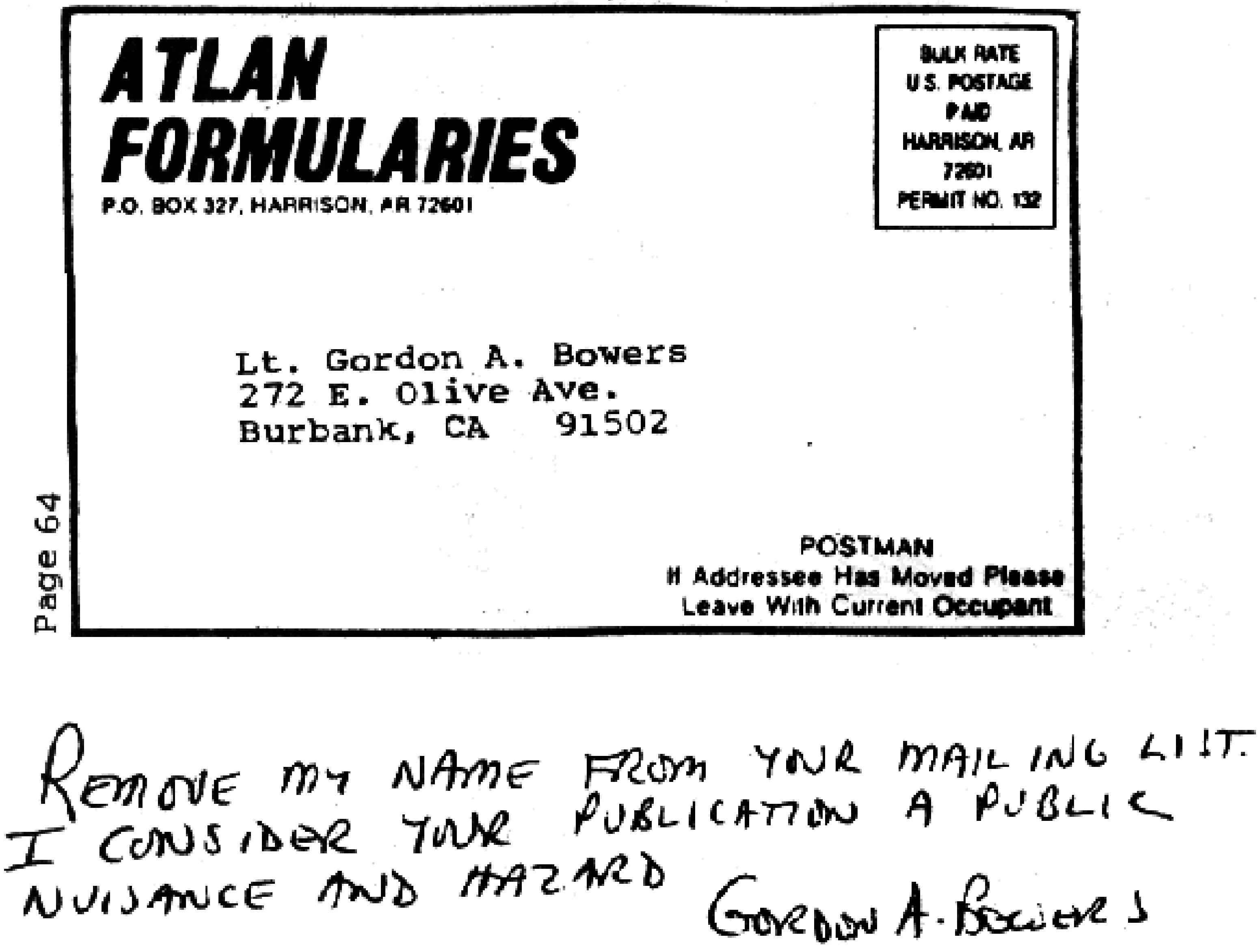
Gentlemen:

A copy of THE SURVIVOR, Volume 6, No. 4, was received by Chief Robert K. Goodnight, P. O. Box 188, Sells, AZ 85634. Chief Goodnight of the Tohono O'Odham Indian Reservation called my office stating that he found your publication objectionable in that it contained information about violence, mayhem, and death, as well as advertisements for lethal weapons.

In view of the foregoing, and at the request of Chief Goodnight, it is asked that you remove his name from your mailing list. Thank you for your anticipated cooperation regarding this matter.

Sincerely,

D. J. Wood
Postal Inspector
P. O. Box 20666
Phoenix, AZ 85036-0666
(602) 223-3668



ATLAN FORMULARIES
P.O. BOX 327, HARRISON, AR 72601

BULK RATE
U.S. POSTAGE
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HARRISON, AR
72601
PERMIT NO. 132

Lt. Gordon A. Bowers
272 E. Olive Ave.
Burbank, CA 91502

POSTMAN
If Addressee Has Moved Please
Leave With Current Occupant

Page 64

REMOVE MY NAME FROM YOUR MAILING LIST. I CONSIDER YOUR PUBLICATION A PUBLIC NUISANCE AND HAZARD

Gordon A. Bowers

In the '60s several police officers were maimed or killed by improvised weaponry directed at them by radicals. Their main danger lay in the fact that they had no knowledge of improvised weaponry. They couldn't recognize an improvised weapon until it blew up in their faces.

When I enlarged "The Militant's Formulary" and retitled it "The Poor Man's James Bond" I sent brochures on it to several thousand police and fire chiefs. Most of them realized the importance of being able to recognize improvized bombs and such and their common components. Thus, when searching a radical's person, vehicle or home, if he was carrying or making such weapons, the police would know it.

Some police chiefs believed I was some sort of radical myself so they called the Eureka, CA PD. Chief Shipley then prepared the following letter to assure them that I was on their side.

the jug. If a can, cut about a half inch down at the corners and bend outward so the flaps will rest on the table top.

To cut the hole, first drill a hole through and then use a keyhole saw to cut the shape you choose.

To cut the jug in half see the bottle cutter further along. Smooth the edges with a file or emery paper.

Put a one-hole stopper or cork into the neck of the jug or can with a length of plastic or rubber tube leading into a waste bucket.

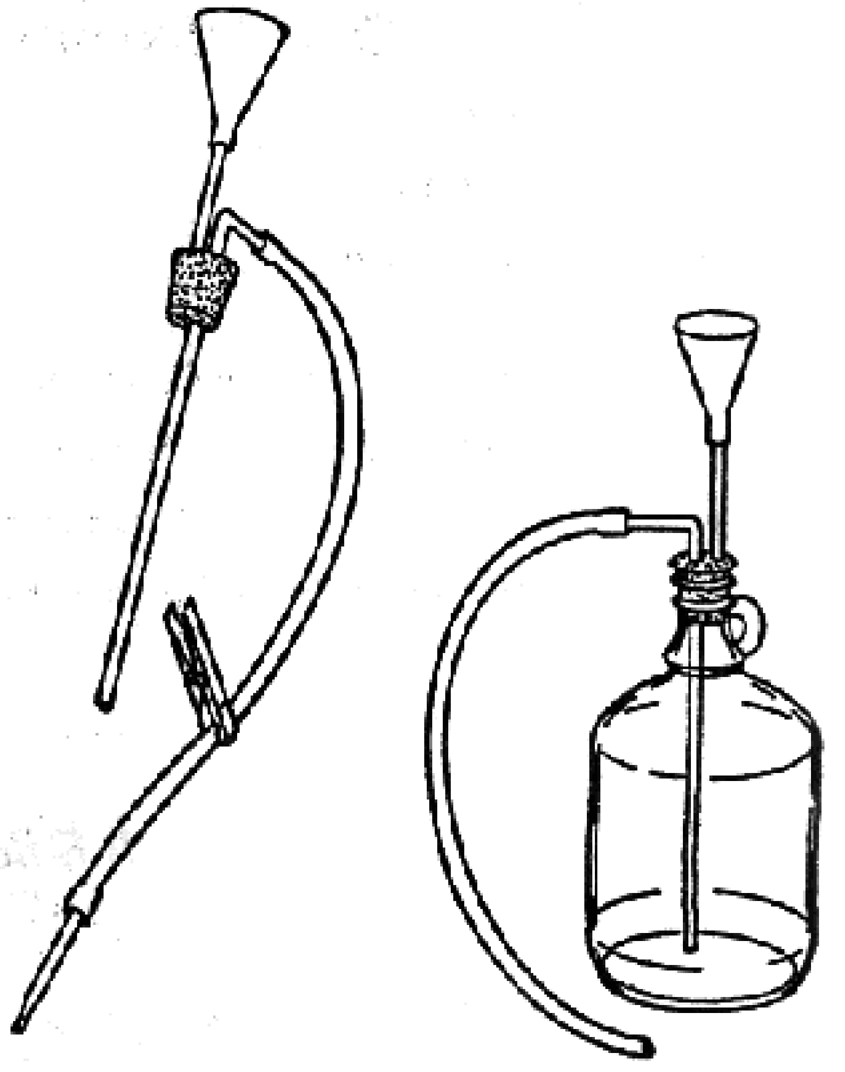
As illustrated, shelves at the back will finish your lab table. They can be a set of book shelves, also bought very cheaply second-hand or can be built with 1 x 12 inch scrap lumber.

GRAVITY WASH BOTTLE

This will give you a steady stream of water and is easy to refill.

You will need a gallon jug with a #6 1/2, two-hole rubber or cork stopper. (Cork stoppers can be drilled to accommodate glass or copper tubing. Rubber stoppers are better and are sold by any hobby chemical supply company. But in a pinch cork stoppers will do).

To complete the wash bottle you'll need a plastic funnel, rubber tubing, glass tubing



CITY OF EUREKA
P.O. BOX [illegible] - EUREKA, CALIFORNIA 95501

This is a copy of the letter sent out by Chief O.R. Shipley, of the Eureka Police Department to civil authorities who enquire about "The Poor Man's James Bond" and its author.

In regard to your inquiry about Mr. Kurt Saxon, Mr. Saxon, aka Don Sisco is a permanent resident of the City of Eureka. He has authored several books on various subjects. His most controversial book has been "The Poor Man's James Bond".

Mr. Saxon is a recognized expert in the field of explosives and their application. He has made in-depth studies of methods employed by the more militant groups. He is a former member of the John Birch Society, the Minutemen and several other extreme right wing organizations. However, over the years he has mellowed and is no longer affiliated with these groups.

Mr. Saxon is very pro-establishment and pro-law enforcement. This department uses Mr. Saxon's expertise in training programs.

Mr. Saxon wishes only to sell his more sensitive books to law enforcement and fire agencies to serve as training manuals in the recognition of bombs, bomb components and techniques.

Mr. Saxon will not knowingly sell his more sensitive books to any left wing group or individual. This department feels that a diligent study of Mr. Saxon's books will assist any department in learning the methods and techniques used by militant organizations.

Yours truly,

O.R. SHIPLEY,
CHIEF OF POLICE

The letter was printed about 1972 and I sold a lot of PMJBs. Redstone Arsenal was conducting a training program for police bomb squads and so bought a couple of thousand copies.

Since I believed this generation of cops would profit by having my three volume library of weaponry, I got a directory listing thousands of police officials. I sent a copy of SURVIVOR 6, issue four and the only replies I got were those above. Not one order!

Of course, I hadn't realized the makeup of today's police. The modern cop has been emasculated by our Liberal judicial system. At the same time, he has been equipped with the latest state-of-the-art methods of crime detection along with self-protecting equipment.

So this "cop" patrols his assigned territory in his rolling fortress. He has a shotgun attached to his dash and a pistol at his side. He also has a radio to summon help if he confronts any criminal more dangerous than a crippled shoplifter.

Although cops get a lot of credit for catching the bad guys, they seldom stop them from committing atrocit-

and a clothespin. Plastic tubing is not as good as rubber, as it's too stiff to be mashed by a clothespin. Even so, you can connect a length of plastic straw to the plastic tubing and that will easily close as the clothespin presses it.

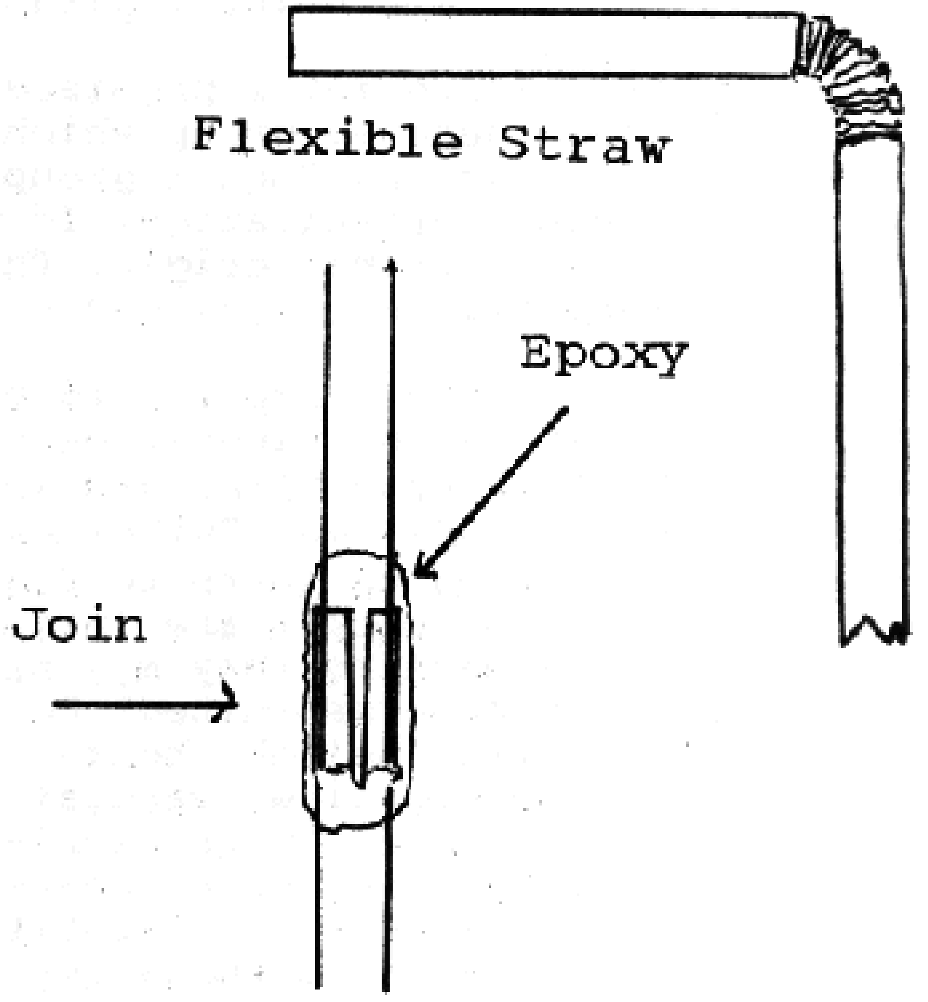
Plastic drinking straws can also be substituted for glass tubing. They are bought at most grocery stores and some are flexible for bending. One thing to note if you are using plastic straws through cork is to smear epoxy around both the entrance and exit points of the cork to make it air-tight.

Plastic straws can be connected, for extra length, Just slit the straw a half inch and push another length in. Then epoxy around the slit and the join and it will be one piece.

If you decide to use plastic tubing, take a plastic straw to the hardware store so as to choose a width which will most easily fit. Whether the plastic tubing goes over or inside the drinking straw, epoxy is the best substance to use to make the joins tight.

To put the gravity wash bottle together, insert the funnel and tubing through one hole in the stopper. (see the thistle tube, further along). Then put the glass or plastic straw tubing through the other hole, as shown.

To operate, fill the bottle through the funnel. Suck on the end of the tubing to



ies. In short, although he is pledged to "Protect and Serve", the modern cop does neither. He can't. His highly visible patrol car keeps all street crime from happening until he moves on. Then the criminal is at liberty to rob, rape, maim and kill any of the unarmed citizenry he has targeted.

Of course, after the deed has been done, police science steps in. The criminal is often quickly caught. This is no help to the victim. And all too often, if the victim lives, the criminal is out of jail before he or she is out of the hospital.

Our Liberal judicial system is so concerned with the rights of criminals that even the best efforts of the police are wasted. After even the most violent and disgusting outrage, the captured criminal must be treated with exaggerated courtesy. Otherwise he is likely to be set free on the grounds that his arrest was improper and his "Constitutional Rights" violated.

Although there are a lot of good men in our police forces, they are nowhere as effective as when I was young. The admission of women into the forces has naturally lowered the standards of aggressiveness needed in an effective police officer. Also, the overall liberalizing of police forces has kept the more rational men out. This has caused our police forces to be "manned" mainly by nitwits who actually do consider the rights of the criminal more important than those of the victim.

Our national crime rate is accelerating and our liberalized police are becoming less effective at protecting us. So we must protect ourselves and each other.

Naturally, most police are dead-set against citizens meting out justice to predators. To those I would submit the following two scenarios.

Scenario 1: A psychotic breaks into a woman's home with the intent to rape and kill her. An armed citizen, or vigilante, if you wish, goes in, kills the fiend before he can do much damage and then fades away into the night.

Scenario 2: A psychotic breaks into a woman's home with the intent to rape and kill her. No one comes to her aid. When her body is found the next day, the local police track down her killer. He is sent to a mental institution for a few months or prison, where, if he behaves, he will be parolled in three years.

Which scenario would you prefer? If you are the typical modern cop you will consider the commendation you get for the killer's capture more important than the woman's life and the safety of the community. If you chose the first scenario you are approving vigilantism. Shame on you! Shame on me, too.

In my last editorial I promised to tell you how to form a neighborhood defense group which would serve both your community and nation. Such a group would not be connected with any radical organization. It would have no basis in race, creed or national origin. There should be no dues, oaths or commitments to any cause but the safety of the community.

The basis of the group should be a martial arts school. This would not be an Oriental martial arts school, cluttered with alien tradition, discipline, foreign phrases and various uniforms and belts. All that is nonsense to one simply wanting to learn to fight.

Actually, most people are intimidated by the idea of training for something they may never have a need for. How often have you been assaulted? Do you hang around in bars and loiter in slum neighborhoods? If your answer to all three is in the negative, martial arts training will simply fit you to protect your territory from likely marauders as our system goes from recession to depression.

Aside from the nonessential-filled Oriental martial arts schools, there are those two-week combat courses con-

start the flow. Then clamp the tubing with a clothespin.

This gravity wash bottle will give you running water for mixing chemicals.

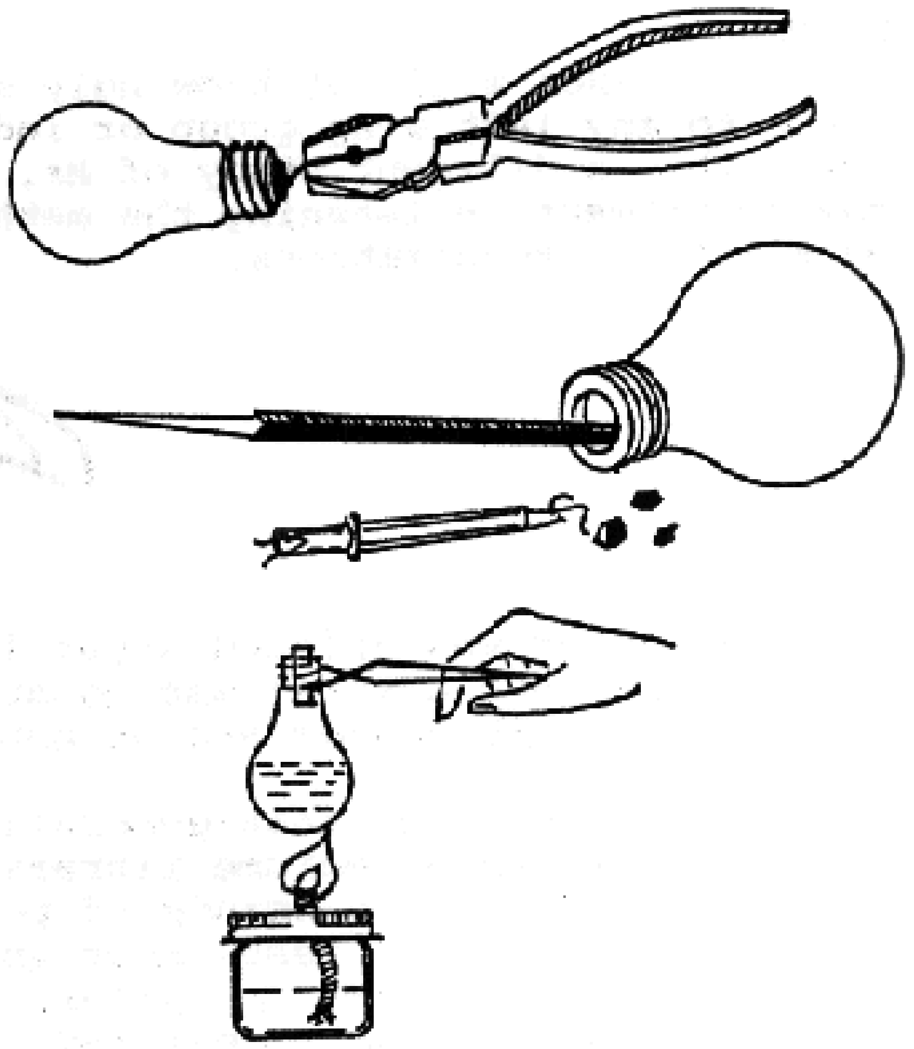
LIGHT BULB CHEMISTRY FLASK

This flask can be heated and used with stoppers and requires only a burned out light bulb.

To turn the bulb into a flask, use a knife blade to bend up and separate the tip from the surrounding baked tar. A pair of needle nosed pliers is better than the pair in the illustration.

Pull off the tip with the pliers and crush and pick out the bits of baked tar. Then pull out the filaments and what you can grasp of the glass pointing up. Now, use any screwdriver, file or whatever, to give a sharp tap to the rest of the glass holding the filaments. Rotate the tool around the inside of the bulb until no more glass juts out.

You will want a clear flask and the frosting is easy to remove. Simply stick a toothbrush inside the bulb and rotate it against the sides. Now all you have to do is rinse the bulb out with water.



CUTTING GLASS TUBING

You really ought to get a few feet of various sizes of glass tubing. Improvisation sisting of running through the woods collecting ticks and chiggers. That's about all such courses amount to. And they average $350.00 per course.

Such quickie combat courses have a potentially fatal drawback. They make a novice overconfident. Simply learning to throw an opponent under the direction of an instructor gives nothing but surface knowledge. The brain may absorb certain rules of hand-to-hand combat but the body has to be trained to make those moves reflexive. Two weeks doesn't do it.

Whatever you do, don't waste money on those stupid Ninja books. "Ninja" is simply a Japanese word for assassin. We have their equivalent in the Mafia hit man. You don't need to practice creeping, climbing, crawling and clawing for several years just to put a bullet or knife into some slob.

Besides, there is no proof that the black-clothed, gadget-encumbered Ninja of the films and those ridiculous books ever existed as portrayed. Also, where were the Ninja on Guadalcanal or Guam? I'm sure the Japanese military would have used them if they'd had them.

If the films and books are to be believed, a half-dozen Ninja could have gone behind the American lines and wiped out every Marine contingent. The idea is not without precident on our side.

A Mafia hit-man was drafted for WW II. One night he slipped behind the German lines and found a company of soldiers, asleep and mostly huddled together for warmth. He slit the throat of one, ear-to-ear, while he was lying next to a buddy. When the other awoke, he went mad. The whole company was demoralized and paniced. The idea that an American could get that close to sleeping but heavily guarded men far from the front lines was a mind-blower.

Then there was Kommando leader Otto Skorzeny's men who dressed in American uniforms and infiltrated American units. You've probably read of the havoc and confusion just a few of them caused in the American lines.

If Mafia men could be drafted, so could Ninja in the Yakuza. "Greetings" from Hirohito meant the same thing as from Roosevelt. Conclusion: the Ninja and their prowess are largely mythical. Don't waste your time and money.

Getting back to starting a group; first develop something to attract the kind of people you want. This would be a martial arts school which would be affordable, informal and effective. Give an office worker a place he can go to three nights a week and go from Jiu-Jitsu (Judo), to lethal combat in easy stages and you'll have all the customers you can handle.

Say you have no experience in martial arts. That's best, actually, since you won't have to unlearn a lot of nonsense you might have picked up from a formal school. So, starting fresh, you choose as a partner, a friend you can get along with and enlist him as a business partner and fellow-trainee.

Start with Jiu-Jitsu in PMJB 2. Learn and practice each lesson until it is reflexive to both of you. This should take a couple of hours each evening for about two months. By now you should be a match for just about any moronic roughneck who might threaten you.

Having mastered Jiu-Jitsu, go to the Army course in PMJB 1. Learn every attack and defense there until both of you are an even match. Next, master the Marine course and consider yourselves ready for business.

Most towns have empty stores on the square or near it which can be rented cheaply. All you need are a couple of wrestling mats, a sign reading "American Martial Arts" and some newspaper ads. You might also talk to your local reporters about the school. In your ads and interviews, tell people your school will teach self-defense to anyone for only $25.00 per week in easy two-hour sessions three times keens the mind but you must not take it to extremes.

So let's say you've gotten a supply of glass tubing from your pharmacist, a chemical catalogue or your friendly sign maker, who has access to glass tubing for neon signs. Working with it will not only give you new skills but better lab equipment. Also, it's fun.

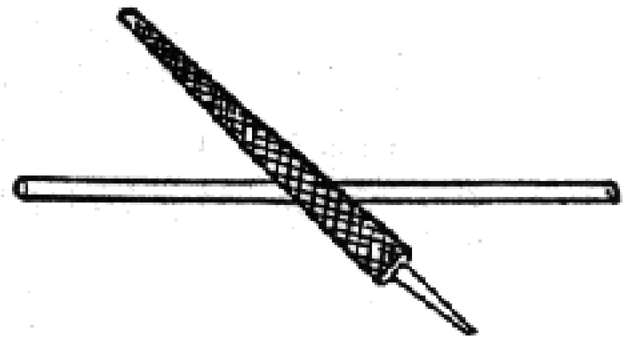
To begin, place a length of glass tubing on a smooth surface. Decide where you want to break it and give that spot a sharp rake with a file. Then, grasp the tubing firmly with your thumbs near the mark. Now bend the glass back from the mark and it will snap cleanly.

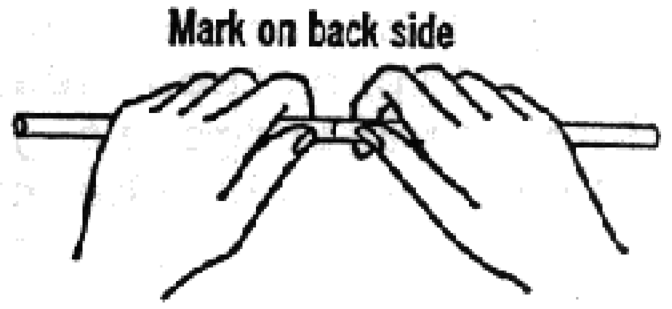
To insert the pieces of tubing into the rubber stoppers or corks, dip them first in soapy water so they will slip in easier. If you use corks, epoxy around the tubing on both sides.

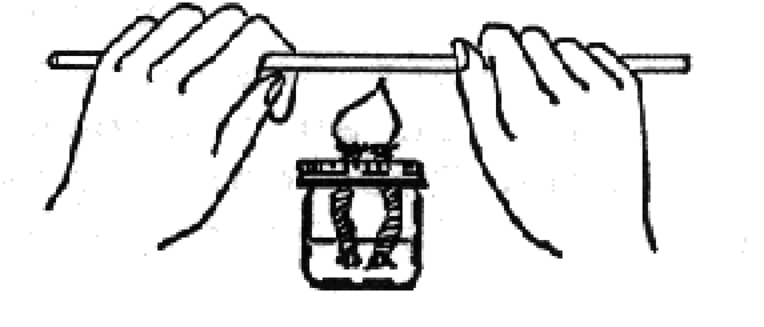
BENDING GLASS TUBING

Basic glass bending is very simple. The part to be bent is held over the flame and rotated until it glows red all around. Then bend it. Now, hold it for about ten seconds until it hardens.

An alcohol flame is not so hot as a gas flame from a bunsen burner or a propane torch. Actually, you can buy a propane torch with all its attachments cheaply from the hardware store. It can be put







per week. Most people can afford that and only 100 customers would give you $2,500.00 per week.

Open up from 2:00 pm to 10;pm six days per week. That would give you eight two hour classes each week. Figure on from ten to twenty students per class; mostly women from two to six pm and mostly men from six to ten pm.

The idea would be to teach each student the basics and have him or her practice with another while you and your partner coach and watch so no one gets hurt.

You might consider stocking my books in your school. Each student would buy PMJB 1 and 2 and probably 3 and the Survivor series. In this way they could study the moves in PMJBs 1 and 2 and so would have a clear idea of what they were to learn.

All my books will retail at $22.00 each and with 50% off to dealers, you would make 100% clear profit, since you would sell direct. The students who bought every book would be those most aware of the state of the world. These would be the most likely candidates for a community defense group. These would also be the most likely to go from Jiu-Jitsu to the more lethal aspects of American Martial Arts, including improvised weaponry. (You would have to let your students learn improvised weaponry on their own, as that subject would put you on very shaky legal ground).

As time went by, you would find you had a ready-made group of like-thinking men and women. You wouldn't need a name for it or any clearcut philosophy or ideology. But as things got worse in your area you would have quite a large group of trained, natural gurillas to draw on. With them you could insure the community's internal security as well as a defense against outside antagonists.

IMPROVISED WEAPONRY AS A MARTIAL ART

From Taekwondo Times

The true Martial Artist is a danger only to the dangerous. With skill comes responsibility along with confidence. This adds up to a self-reliance which makes anyone with that discipline an asset to those around him.

But as one develops personal mastery, one anticipates a time when his services will be needed by the community. Then, as martial artists of old were called upon to defend their less-able brothers, he will need to know the arts of improvised weaponry.

Such knowledge is just an extension of his own body, as was the nunchaku (rice flail), etc. Tyranny cannot prevail where the martial artist protects.

Kurt Saxon's Poor Man's James Bond series is the most complete, and growing, collection of methods of improvised weaponry. No invader or home-grown despot can disarm a community or feel safe in an occupation.

Beyond The Poor Man's James Bond, the Survivor series teaches domestic self-reliance so

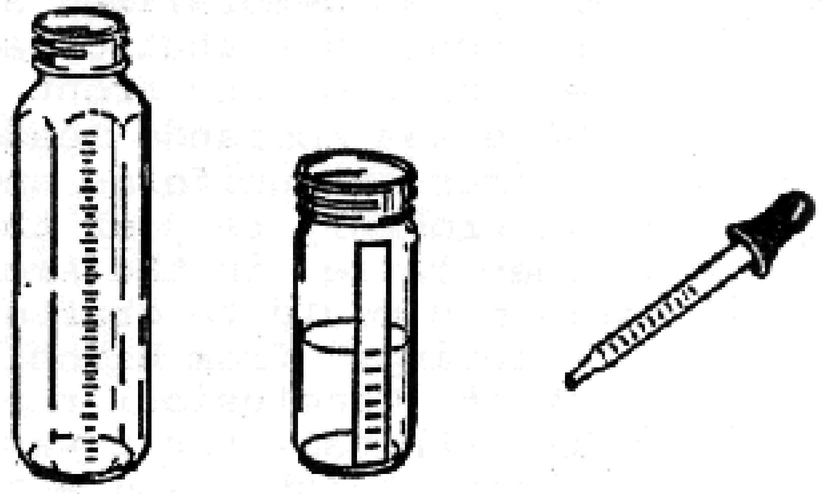
on the shelf when not in use and is much more efficient for glass work than the alcohol burner.

For a complete course in glass blowing, bending, etc. see GRANDDAD'S WONDERFUL BOOK OF CHEMISTRY.

GRADUATE AND CHEMISTRY FLASK

A graduate is a container with marks to measure liquids. An excellent graduate, and also a flask is a baby bottle. It will take the heat from an alcohol burner so it can also be used as a large test tube. Fitted with the right sized stopper with one or two holes, it will have many uses.

A smaller graduate is a common medicine dropper and even better is a hypodermic syringe. The dropper can be bought at any pharmacy and if they have none with marks, you can put them on with a ruler and a felt pen.



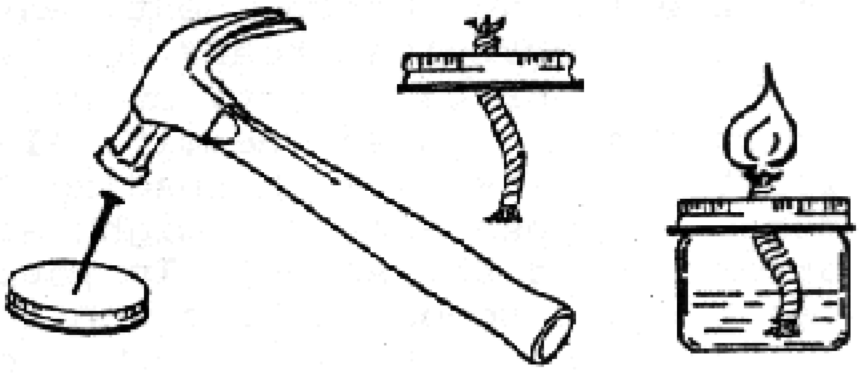
ALCOHOL BURNER

This is simple to make from a baby-food jar or any other of a chunky kind with a metal lid.

Punch a hole in the middle of the lid and work it wide enough to hold a four-inch length of cotton rope.

Rubbing alcohol, bought at any grocery or pharmacy is the safest fuel for such a lamp.

Fill the jar, tighten the lid and turn it upside down until the exposed part of the rope is saturated. Then turn it right-side up and light.



no one need starve or do without any of the necessities of life.

To combat stress, Mr. Saxon has even made a hypno-tape which guarantees clearness of mind and the banishment of worry. It enables the user to plumb his subconscious for buried answers to the problems that are holding him back from accomplishing his true potential.

All-in-all, Saxon's books and tapes are a positive reinforcement of the Martial Artist's striving for power over any threats to himself or his community.

MATCH HEAD BOMB

Simple safety match heads in a pipe, capped at both ends, make a devastating bomb. It is set off with a regular fuse.

A plastic Baggie is put into the pipe before the heads go in to prevent detonation by contact with the metal.

Cutting enough match heads to fill the pipe can be tedious work for one but an evening's fun for the family if you can drag them away from the TV.

NAPALM

About the best fire bomb is napalm. It has a thick consistancy, like jam, and is best for use on vehicles or buildings.

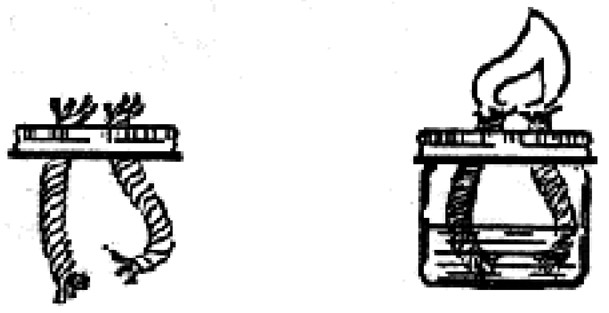
Napalm is simply one part gasoline and one part soap. The soap is either soap flakes or shredded bar soap. Detergents won't do.

The gasoline must be heated in order for the soap to melt. The usual way is with a double boiler where the top part has at least a two-quart capacity. The water in the bottom part is brought to a boil and the double boiler is taken from the stove and carried to where there is no flame.

Then one part, by volume, of gasoline is put in the top part and allowed to heat as much as it will and the soap is added and the mess is stirred until it thickens. A better way to heat the gasoline is to fill a bathtub with water as hot as you can get it. It will hold its heat longer and permit a much larger container than will the double boiler.

BROAD FLAME ALCOHOL BURNER

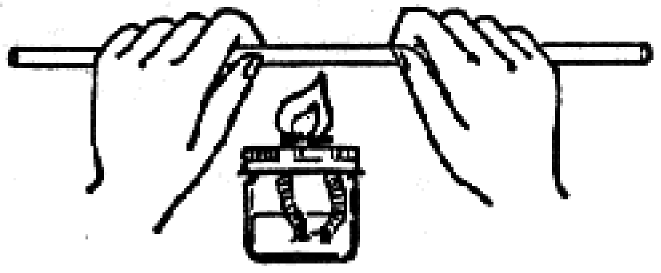
This one gives more heat over a wider area and is used mainly for glass work as it will enable you to bend glass into all kinds of odd shapes.

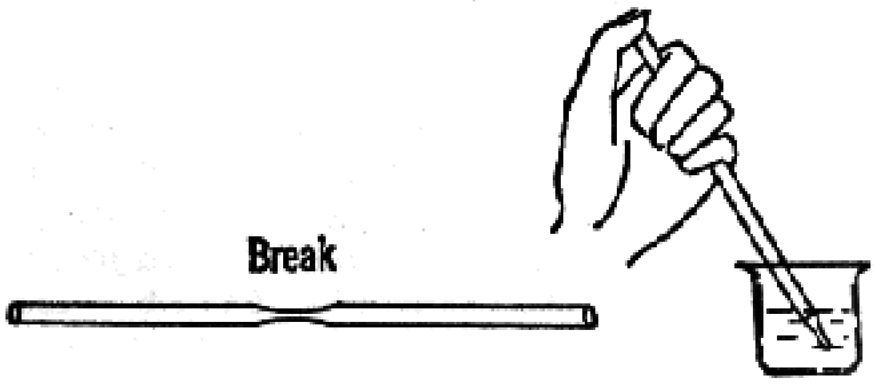


PIPETTE

With a pipette you can lift small organisms or flecks out of liquids. Also, you can pick up very small amounts of a liquid much easier than pouring. You might even mark the pipette for use as a measure.

To make pipettes, hold a length of glass tubing over the flame and, when it reddens all around, pull it gently at both ends until the middle is quite thin. Then break it in the middle.





To use it, put your thumb over the wide end and place the tip in the liquid directly over the particle you want. Then remove your thumb and the liquid will automatically rise and carry the particle with it.

MOUTH PIPETTE

The mouth pipette does much the same as the regular one but better. If you need a certain amount of what you're working with. You can suck up exactly as much as you need or can fill the pipette and, drop by drop, realease an exact amount into a process.

All you do to make it is to force the larger end of the

HOW I BOMBED ON THE DAVID LETTERMAN SHOW

By Kurt Saxon

A while back I was invited to be on the David Letterman show. The girl who called me said they had a copy of my book, "Granddad's Wonderful Book Of Chemistry" and thought it would make for an interesting subject. I thought so too and, as usual, I jumped to conclusions and suggested I could do some chemical magic. Actually, the copy they had was the early edition which didn't have "Chemical Magic" in it.

So, instead of going on the show and explaining the delights of being a mad scientist I volunteered to demonstrate. Never volunteer! Over the phone, the producer was quite excited about the project and urged me to do at least six demonstrations, as my segment would be from six to eight minutes.

I soon realized that maybe I had bitten off more than I could chew. I explained that I was experienced on talk shows but had never done any sort of performing. The producer encouraged me to do my best so I picked six examples I thought were simple and basic; spectacular but harmless.

One was nitrogen tri-iodide from page 150, XLII. Another was the ignition of potassium chlorate and sugar from page 153, XXXIV (i). Then came the spontaneous combustion of mercury, potassium and sodium; page 153, XLII.

Burning water came next; page 155, LVI. After that I meant to demonstrate lighting a cigarette with an ice cube; page 156, LXXIV. Last was simply how metallic sodium catches fire when wet.

At home I did all these projects with no trouble that I can remember. When I did them in rehearsal, a half hour before taping, everything went wrong. This was entirely my fault. I took everything for granted. Not having performed so before any audience, I didn't know enough to practice under stage conditions, even though the effects worked the first time.

I started setting up about three hours before I was to go on. First I mixed up a large, large, large batch of nitrogen tri-iodide. Better too much than too little, I thought, since the nitrogen tri-iodide would take an hour or more to dry. One of the stage hands had told me to make two batches so I could use one at rehearsal. I did and made even more than was in the first batch.

Rehearsal time came around and I put one board with the nitrogen tri-iodide on a tall, wheeled table and a stage hand moved it out in front of the cameras. I had everything lined up and began doing the various demonstrations and everything went wrong. First I put a slice of sodium in a pan and flooded it with water. It didn't burst into flame but just sputtered and gave off puffs of smoky mist. It had flamed at home, but not there. Why?

It occurred to me on the plane going home. When I first tried it I sliced off a piece of sodium and dropped it into some water. It did burst into flame. Another slice I'd laid aside just spluttered. I should have realized it at home when I first tried it. When sodium is first sliced, it is shiney and will ignite on contact with any moisture. However, it oxidizes almost

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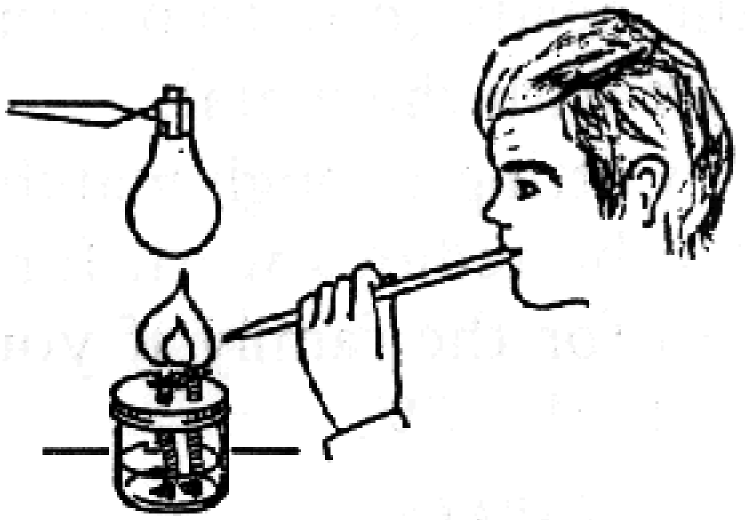
pipette into a foot of rubber or plastic tubing.

BLOWTORCH TYPE BURNER

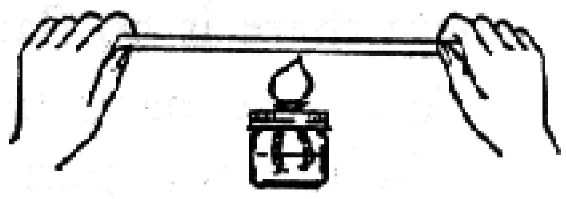
To turn your burner into a blowtorch, simply use the pipette to blow into the flame. This adds oxygen which makes the flame much hotter.

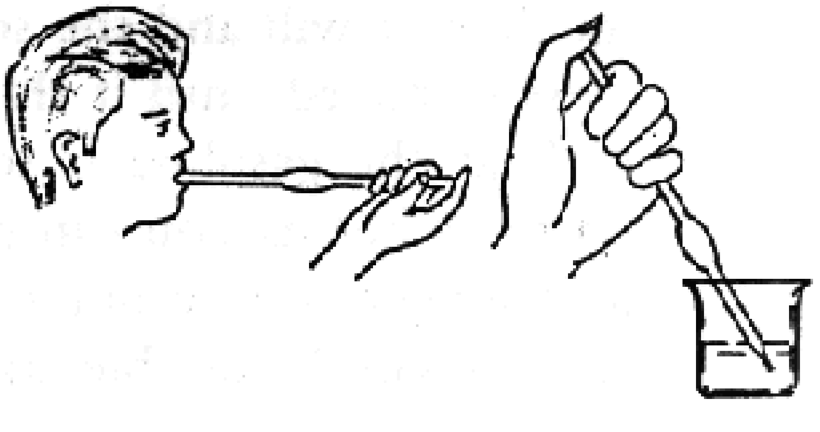


LARGE PIPETTE

This lets you gather larger amounts of liquid. Making it also shows you a simple principle of glass blowing which might encourage you to make even more complicated glassware.

Take a piece of glass tubing one foot or less and hold the middle over your broad flame or bunsen burner, turning until it glows red. Then put a finger over one end and blow into the other. The middle will bulge out over the length of the heated part. Try it. It's fun.





immediately, even as one watches, and becomes covered with a kind of whitish rust.

When put in the water at the studio, the oxidized sodium spluttered because of the insulating property of the oxide. As water penetrated the layer of sodium oxide it only created more oxide so no actual flaming occurred and it just spluttered.

The same oxidation prevented the cigarettes from being lit by the ice cube. When I was at home I tried the cigarette lighting trick in the kitchen because that was where the ice cubes were. I took one of my wife's cigarette butts from her ash tray by the sink and poked a space in the tobacco with a toothpick. I then put a fresh sliver of sodium in it and held an ice cube to its tip.

One drag and it was lit. This was because the cigarette was bone-dry and the sliver of sodium had no oxide coating. But when I prepared three fresh cigarettes on the set, none of them lit. Frustration. Of course, the fresh cigarettes were moist and so caused the oxide coating. The book suggested drying the cigarettes in the oven but I didn't pay attention.

Then there was the burning water trick. It worked at home because I had a large, glass petri dish with a fresh sliver of potassium in a layer of ether about an eigth of an inch thick. This kept the potassium from oxidizing. When I poured in some water, the ether stayed on top and the water ignited the potassium, which ignited the ether, producing a startling flame.

On the set, however, I had put the sliver of potassium down while doing something else and it had gotten a thin coating of oxide. Instead of the petri dish, I had a tin pie pan and used too little ether. So when pouring in the water, the oxide kept the potassium from igniting and it just spluttered and bubbled, pushing the too-thin layer of ether away.

I didn't get around to mixing the sodium, potassium and mercury. That would have worked but was not spectacular. What did me in was the potassium chlorate and sugar ignited by sulphuric acid. Nothing could go wrong with that but what it caused was something I hadn't anticipated.

I had put the board spread with about six square inches by one eigth of an inch of nitrogen tri-oxide about the middle of the table. Barry, one of the executives, was leaning against the table with his left ear about two feet from the nitrogen tri-iodide. I didn't notice he was so close because I was preoccupied. When I did the on-camera performance I had intended to have David stand at least three feet back.

Anyway, after the failure of some of the most obvious demonstrations, like the igniting of the ether and lighting the cigarette with an ice cube I was worried that I wouldn't have any reason to be on the show. I believe it was this feeling of frustration which kept me from being aware of the consequences of carelessness. At any rate, instead of having Barry stand well away, as I would have had David, I didn't even notice he was so close to the nitrogen tri-iodide.

But I was not only feeling frustrated but being stupid, I remembered that dropping sulphuric acid on the small pile of potassium chlorate and sugar did ignite beautifully and send pretty sparks all over every time. Perhaps I felt I could show Barry I could get something to work after all.

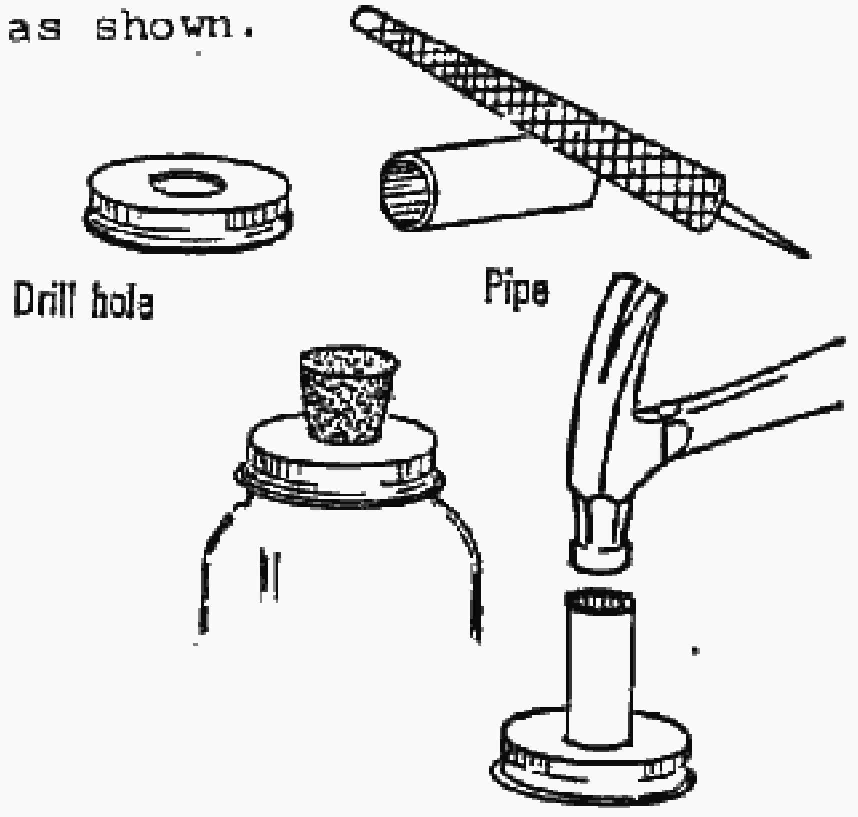
Then it happened. The potassium chlorate and sugar mixture did ignite beautifully and sent sparks everywhere, including into the large smear of nitrogen tri-iodide. What followed was not a bang but a boom. It sounded like nothing less than a bomb going off in the

MASON JAR CHEMISTRY FLASK

Mason jars are made of pyrex and so can be heated with an alcohol burner. They make very good large flasks. They come in quart, pint and half-pint sizes. They are also easier to clean than regular flasks.

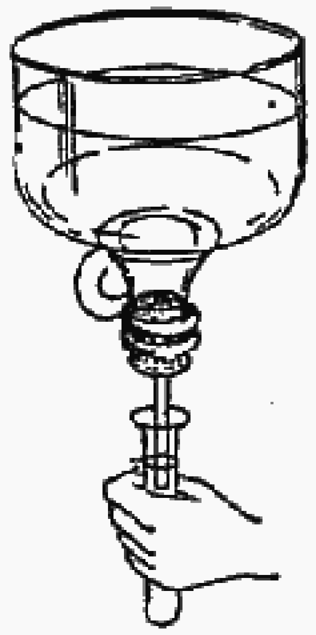
The lid for the flask can be either a two-part Mason jar lid or one from a mayonnaise jar. Make a stopper-sized hole in the top and make it from the top of the lid inward so the stopper will go in smoothly.

You can either drill a hole and enlarge it with tin snips and a file, or make a punch, or punches for different sized stoppers. Punches are made from short pieces of metal pipe 3/4 or 1 inch in diameter. The outside edge of the pipe is ground or filed so it is quite sharp. Then, with a bit of wood under the lid, the pipe is centered and hammered as shown.



FUNNEL

Plastic funnels of nearly any size can be bought at your supermarket. But you can also



studio and was heard all over that floor and the floors above and below.

Barry was understandably traumatized and in a state of shock. He skittered sideways away from the explosion and sat down on the edge of the stage. He then yelled, "Am I bleeding? I can't hear. Can I get this stuff out of my pants?"

He wasn't bleeding and his temporary deafness was to be expected under the circumstances. He was wearing white pants and there was nothing on them I could see. In a few minutes his hearing returned and he was out of shock and had suffered no injury. But I was truly sorry I had upset him so.

Naturally, David had heard the blast and refused to experience anything like it. I suggested to the producer that recounting the string of errors would make an amusing segment. But they were all too shook up to consider the subject so I was bumped.

If you watch talk shows on a regular basis you've heard many references to guests being scheduled but not being on the show. This happens quite often. It is usually because schedules are so tight and there is so much involved that they can't take any chances with a guest who might interfere with the show's even timing.

For weeks after, I was getting calls from readers all over the country who heard David mention me. Was I supposed to be on that show? Would I be on later? (They had watched every night after that). Anyway, I could only tell them that it was up to the producer to reschedule me and I was sure that chemical magic would not be the subject.

So take a lesson from my experience. When you do an experiment from GRANDDAD'S WONDERFUL BOOK OF CHEMISTRY, follow it to the letter. Don't take anything for granted. And if you mean to perform before any audience do the thing at least six times first, rather than once at home and then bombing before your audience like I did.

What Is A Secret Agent?

by Kurt Saxon

A lot of my readers were confused by my Secret Agent concept. Since our country is terribly in need of Secret Agents, I'll separate fact from myth so you can see if you qualify.

You probably got your own impression of Secret Agents from the James Bond series, Patric McNee and Diana Rigg of "The Avengers" and Patrick McGoohan of "Secret Agent". These are the idealized Secret Agents and more in line with what a Secret Agent ought to be.

In actuality, however, the average Secret Agent is more like Don Adams in "Get Smart" or Inspector Clouseau of the "Pink Panther" series, played by the late Peter Sellers. In short, they are stupid and bungling.

The KGB isn't much better. The British Secret Agents are tops. The reason for this is that most of them are trained by the KGB. And since the British are more intelligent than the down-bred Russians, they know how to use their training. But the American Secret Agent is usually a paranoid clod, or traitor.

The FBI Agent isn't necessarily a "Secret" Agent. But he is so ineffective that he is usually a waste of the taxpayers' money. The secret is how he stays on the payroll. The reason for this is that the recruit has to be so Joe College, too straight and "normal". Thus, he can't identify with anti-establishment types to the degree it takes to learn what they're up to.

The ATF has the worst reputation among the weapons

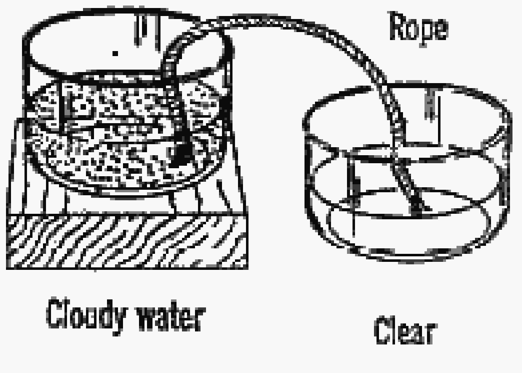
make your own in a pinch from the tops of glass or plastic bottles. A knife and scissors are all you need to work with plastic bottles but for glass, you'll need the nichrome wire bottle cutter.

A gallon jug top can be as big a funnel as you'll need. By using a stopper with glass or plastic tubing, it can be as small as you may want it.

An extra in making the funnel from glass is that the bottom part can be used as a lab bowl.

STRING FILTER

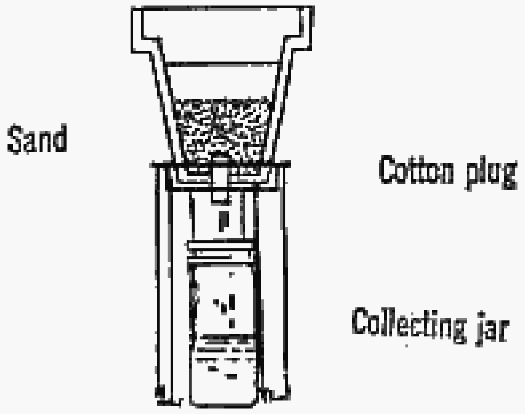
This is a clever way to filter a liquid without filter paper. All you need is a few inches of cotton rope, or even heavy twine, and two bowls. Place the bowls, one higher than the other, as shown. Then put the rope or twine in one bowl leading to the other and wait a few hours.



PLANT POT FILTER

For this you need a clay flower pot, some sand and a piece of cotton rope or rolled up cotton for a plug.

First put in the plug, then add a few inches of sand. The nice thing about the sand for filtering is that what you want left behindwill be held away from the plug by the sand and so will not clog the plug and stop the filtering action.



crowd but this is largely undeserved. For the most part they are intelligent and decent. But the excess zeal used by an occasional dingbat has given a good group a bad image. Also, they are greatly understaffed and so are generally innefective against the real criminal element.

But by far, the worst lot of "Secret" Agents is the CIA. Vice President Bush used to head the organization. When Reagan dies, if Bush runs the country like he did the CIA, the country's done for.

It took me only one run-in with the CIA to give up on them. When I perfected my Fang I decided to market them through the CIA. The idea was that if I made them and an Agent was caught in a foreign country, the weapon could not be traced to the government.

I called their headquarters in Langley, Virginia, (703-352-1100) and the phone was answered by a token darkey straight out of Central Casting. I told her I wanted to talk to someone in covert operations, or whatever they called that department. She told me I'd have to give her the name of someone in that department. It ought to have been obvious, even to that stupid bitch, that I didn't know any such name but I patiently told her to put me in touch with anyone handy.

A male darkey came on the line and I wondered if I'd called the NAACP by mistake. He had never heard of me and was impatient, as if he wanted to get back to his mop bucket. I told the idiot I wanted to send the agency a copy of THE POOR MAN'S JAMES BOND and THE WEAPONEER and a sample Fang with vaccine bottles of nicotine sulphate, potassium cyanide and ricin. When his room-temperature I.Q. grasped the idea that I was offering weapons for their Agents he snapped, "We don't kill people" and hung up.

Still hoping, I called an ATF Agent in Dallas and told him my problem in getting the real CIA to stand up. He gave me a number to call in Little Rock, (501-378-6181). I called and the phone was answered by a seemingly-concious woman who connected me with an Agent. This boob didn't want to give his full (or real) name but let me call him "Jim". I told him what I told the ATF Agent and he asked me if I wanted to join the CIA. Nothing in what I'd said was even a suggestion that I was looking for a job. I answered that I already had a job and just wanted to offer my services. As if he hadn't heard a word, he said he'd take my phone number and they'd get back to me if they needed me. To Hell with them.

Their most famous graduate, the bungling slob, G. Gordon Liddy was for a time, the prime example of a Secret Agent. He screwed up the Watergate break-in and was jailed for it.

More recently the CIA mined the harbor in Nicaragua, ineffectively. It simply damaged some of our allies' ships and America's reputation.

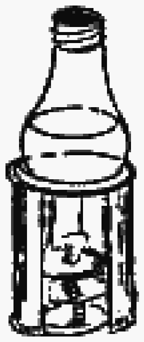
Secret Agents could do a lot to stop terrorism, especially by Moslem fanatics. I realize few of my subscribers are prepared to do big things at this time but I'll give a couple of examples of how real Secret Agents could squash terrorism, plus the traffic in dope.

The Moslem fanatics could be gotten to through their religion. Islam's most holy place is the Kaaba in Mecca. A secret agent in a private plane could simply swoop down and drop a pig on the Kaaba. To Moslims and Jews, the noble pig, food of Vikings, is unclean.

To drop a pig on the Kaaba would be the most blasphemous insult imaginable to Islam. On one of its legs

TRIPOD CANS

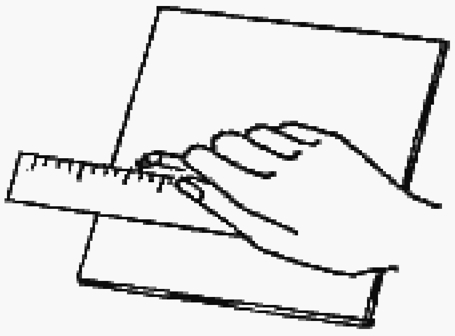
The purpose for these cans is to hold flasks or bottles away from the direct flame of your alcohol or bunsen burner. Collect a general assortment of different sized cans. Punch holes in the middle of the can bottoms. With tin snips or sharp scissors, enlarge the holes to accommodate your various sized flasks.

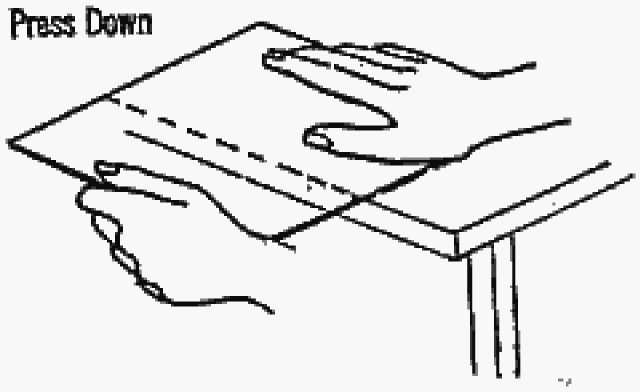


To make a tripod from a tin can, use the tin snips to cut strips from the open end down to the other end. You can cut three or even four strips out. The number doesn't matter as long as there is plenty of ventillation for the flame and strong support for the flask.

GLASS CUTTER

To cut microscope slides and glass for other lab equipment, lay the glass flat on some newspapers. With the ruler held firmly, run the glass cutter along a straight line. Then put the pane on the edge of the table with the wanted part jutting out over the table's edge. Now, simply snap the glass apart at the cut.





could be the message: "This is a pig. Release all American hostages, immediately. Any further actions against Americans will result in our return. And then we won't drop a pig".

The reaction would be outrage by every Moslem nation as you can well imagine. But the threat to their most holy place would force every Moslem to give up on even the slightest anti-American act. Even the most psychotic Moslem fanatic would realize that for him to cause the destruction of the Kaaba would keep him out of Pardise.

The dope traffic costs America billions of dollars each year. It also costs the lives and fortunes of thousands preyed on by muggers, burglars and doped-up psychotics. Of course, the whole dope problem could be resolved by legalizing drugs and letting the nation's inferiors blow their useless minds with no real loss to society. But this will not be done.

Even so, Secret Agents could intercept batches of heroin and cocain and lace it with ricin. Those who shot up or snorted the doctored dope would die. Depending on the area, Hollywood producers of the scummiest movies would go, inept politicians would make room for men and hopefully, a few Rock 'n Roll idols would bite the dust.

Nothing but positive results would come from poisoning illicit drugs. Aside from the initial elimination of some of the worst elements of society, only the suicidal would continue using.

Those two operations must be left to better equipped and financed Secret Agents. But you can think of many small ways you can act to preserve the best of our culture.

Secret Agents don't necessarily have to work alone. You may need help in training, even though you must not let even your closest friends in on certain personal activities. The "need to know" rule is a must for a Secret Agent.

Establish a reputation for something as far from your hobby as possible. Boast of your prowess in martial arts or underwater basket weaving. But don't express any interest in Secret Agenting to anyone you aren't trying to recruit, and then only if he is a very likely prospect.

Here I must warn you against joining any political activist groups. Such groups are always membered by the unstable and untrustworthy. I learned this in the sixties when I joined every right-wing group I could, except for the Klan. I drew the line there. A man who likes to dress well simply can't get those robes to drape properly.

Political groups are always either infiltrated or filled with big-mouths who are all talk. Anything done will be done by you and they'll turn you in simply for a pat on the head.

In the meantime, go to every gun show you can get to. There is the place to make contacts and to collect your arsenal.

While working on this, I was watching RED DAWN on TV. If you never plan on doing anything until the real RED DAWN hits us, you'll still have justified your existence.

At the beginning of the picture, a statue of Teddy Roosevelt was shown and his quote: "Far better it is to dare mighty things, than to rank with those poor, timid spirits who know neither victory nor defeat". There's your rationale for being a Secret Agent.

BOTTLE ETCHER

With a glass cutter bought cheaply at any hardware store, you can make cuts in bottles which are enough to cause them to break cleanly with the application of heat.

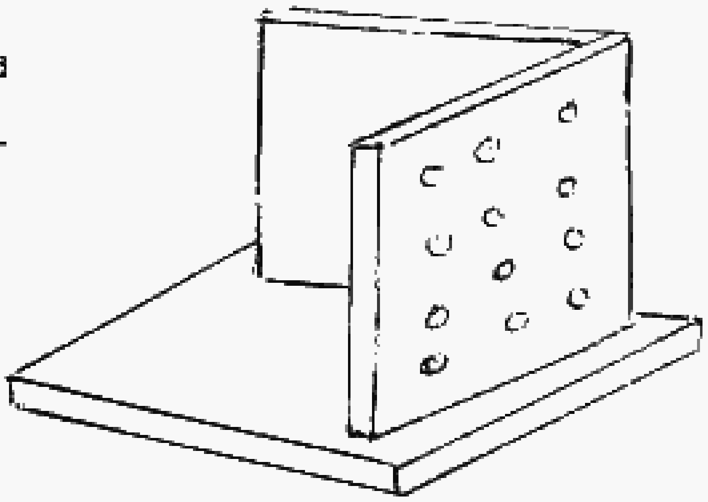
However, the break will be only as clean as the cut around the bottle is even. For this, you will need a form which will allow an even cut.

The best form is one which will allow you to cut any size bottle at the height you need to get the container you want.

The simple form described will do just that. With it you can cut petri dishes, bowls, funnels or anything else you may have a use for.

First, get two one inch by twelve inch boards and another to mount them on.

Drill about a dozen holes nearest to the size of the glass cutter. Mount the two boards in a broad V which will accommodate anything from a gallon bottle down to a pint.



Nail the boards firmly from the bottom.

To use, push the bottle as far into the V as it will go and insert the glass cutter in the hole nearest the height and diameter you want. Hold the glass cutter firmly to the bottle's side and turn the bottle a full circle, or two.

Now it is ready to heat and break.

BOTTLE CUTTER

This is a dandy tool which will enable you to cut bottles to any size.

First, make the simple stand shown. Then screw in two

THE MOLEHILL THAT ATE LOS ANGELES

I love smears by the press. As a former reporter I find it hilarious that "journalists" are so intimidated by THE POOR MAN'S JAMES BOND that they figuratively soil themselves when dealing with it. This latest is a classic and I want to share it with you.

Denise Hamilton of the Los Angeles Times called and questioned me on my lack of responsibility in publishing such dangerous material. What with such a high incidence of dementia in L.A. County, any suggestion of the lethal application of common substances must be done with criminal intent.

That seems to be the thrust of her article. She criticizes me for my callousness in publishing a three sentence description of oleander,(See top left of page 50). Then she elaborates on the oleander, its availability to L.A. dingbats, how it works, etc. According to her article anyone can poison anyone with little chance of being caught and the only reason the article's poisoner is being reinvestigated is that he had to boast about it. (Due to renewed interest I've reprinted the section on plant poisons).

She quotes my figure of 60,000 PMJBs sold nationwide over the past 17 years. While decrying such a spread of my work she gives no thought to the vast circulation of the L.A. Times, probably a million or more. So now several hundred thousand potential Borgias know just how to do it, far more than I could have reached.

L.A.'s favorite hunting sport, drive-by shootings, have killed scores so far this year. That's a problem for the game warden. But if they follow Denise's advice they might consider sending oleander-laced pizzas to their rivals instead of shooting them.

The whole article was born out of the alleged murder by poison of Tim (Belly) Waters, a Burbank coffin-stuffer, by David (Chuckles) Sconce. Chuckles, who along with his parents is charged with 67 counts of naughtiness, such as selling body parts of uncomplaining clients, clearly had the intention of depriving Belly of certain of his Constitutional Rights.

Chuckles borrowed an old edition of the PMJB from a friend as a guide to dealing with Belly. Poisons were the appropriate choice but, unless he was already familiar with oleander, the PMJB reference would have been inadaquate. I suppose he could have gotten the pertinent information from the library. He might also have called his local Poison Control office. A simple request for their booklet describing most household products to be kept out of the reach of children, as well as

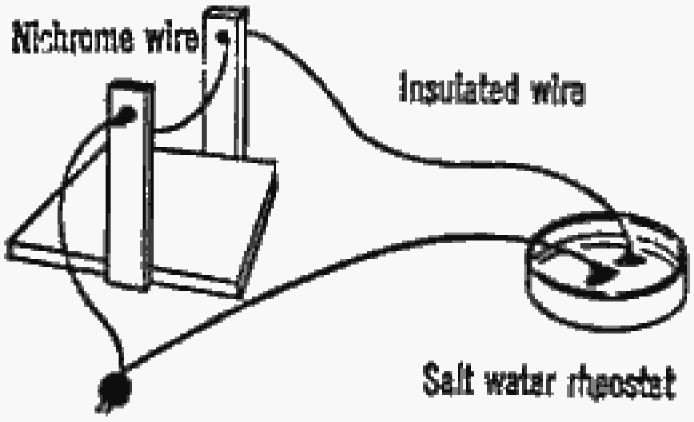
long screws so there is a space between the screw heads and the wood and with the ends of the screws projecting on the outsides of the wooden posts.

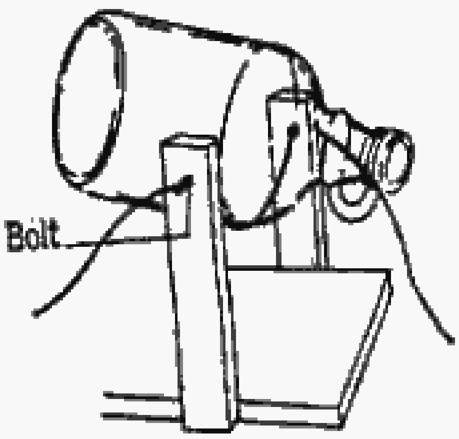
Next, take a six-foot extension cord and cut off the plug. Cut a couple of feet off one of the insulated wires and strip the insulation off an inch from both ends. Wrap one end around a projecting screw. Fit the other end to a small, lead fishing sinker.

Strip the insulation from an inch of the shorter wire and wrap that end around the other projecting screw.

Strip off an inch of insullat from the other wire and fix it to another small, lead fishing sinker.

Now for the nichrome wire. It usually comes coiled and is bought at the hardware store. Hold the coil and pull an end of the wire to straighten the length you want. Wind the ends around the two screw heads so it sags, as shown.





Put the two lead sinkers into a shallow, glass container. Don't let them touch or you will burn out the unit.

You now have a salt-water rheostat, minus the salt. Pure water is a poor conducter of electricity. But the gradual plants also dangerous to the young would have given him a much more detailed description of his sought-after weapon.

So Chuckles was hardly the impressionable dim-wit so often pictured as being turned on by the PMJB.

Another fun thing about such smears is the "authorities" quoted in judging my material. They come out of the woodwork to tell how dangerous is the PMJB. Neil Livingstone expresses the Establishment hysteria regarding lethal knowledge in the hands of us just plain folks.

He pretends to despise my books yet he has not examined any. My books are not meant to teach anyone to do anything to anybody. They teach the making of weapons to use against aggression and future tyranny. He could not cite one case of any cop being hurt or any child blowing himself up because of the PMJB. When he says the PMJB is lacking proper safety procedures, he is as much as admitting he has never examined it. A cursory perusal of NEW IMPROVED PMJB gives clear warnings: Page 79, Flashpowder, 1st paragraph; Page 105, column 1, last paragraph; Page 140, all of INTRODUCTION; Page 195, column 1, bottom. Page 201, column 1, top. These are just a few I spotted by riffling through. Older editions are equally highlighted with warnings. Proper procedures, safety precautions and the accuracy of the formulas should be evident to any knowledgeable reader.

Livingstone no doubt styles himself as an ex-

Continued on next page

addition of salt will cause the water to bubble and this means it is conducting the electricity.

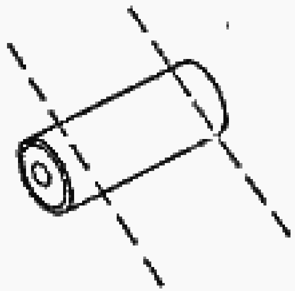
House current is much too strong for such a short length of nichrome wire or flashlight battery carbon rods. Without the rheostat, the insulated wire would melt or a fuse would be blown.

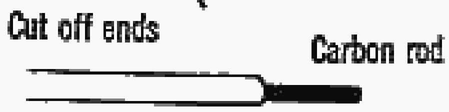
Now plug in to an outlet, add the salt until there are bubbles and watch the nichrome wire turn red.

Etch a line around the bottle with the etcher.

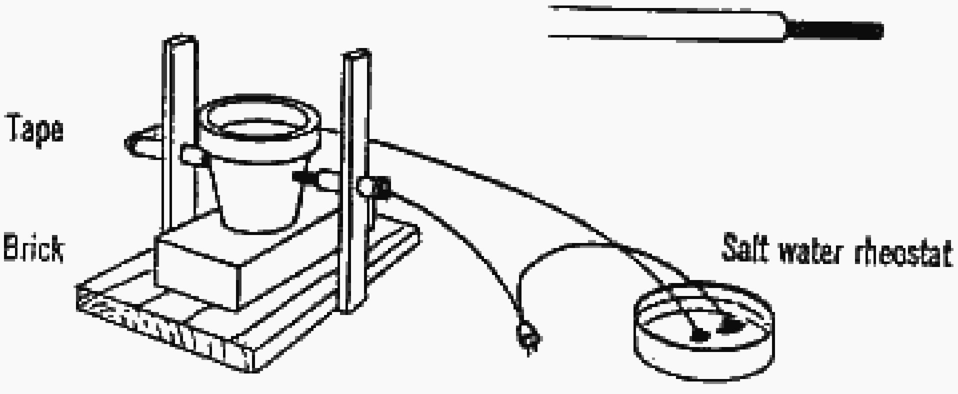
Hold your bottle so the etched part rests on the glowing wire and turn it slowly. The glass will begin to ping. The bottle should snap apart cleanly after one or two revolutions.

Smooth the edges by rubbing with emery paper.





CARBON ARC FURNACE



This simple carbon arc furnace produces a very high temperature at the tips of the carbon rods. It also produces a blinding light, so never look directly at it unless you are wearing very dark glasses.

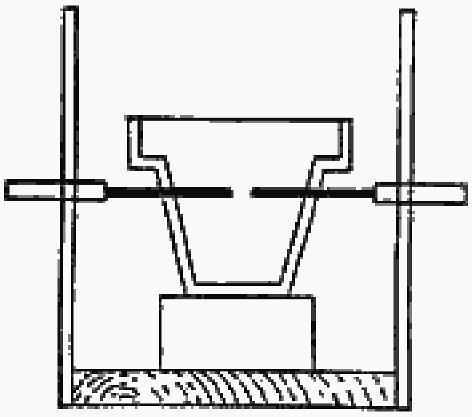
Cut two flashlight batteries at both ends until you get to their carbon rods. Clean off the rods and wrap an inch-wide strip of the metal cover of a battery tightly around one end of each rod.

With a wooden frame, as shown, push the rods through holes drilled through both uprights, with the metal wrappings firmly in the holes, but with the rods loose enough to move back and forth.

Next, bore two holes into a small clay flowerpot with a drill or a screwdriver. Mount the pot on a brick and push the rods into the holes until they are about a quarter of an inch apart.

Connect the bare wires of the extension cord to the metal wrappings, held either by soldering or tape. Put in the plug and pour some salt into the bowl. Then slowly move the rods until they barely touch. At this point there should be a lot of sparks. (When pushing the electrified rods in or out use rubber-covered grip pliers). Pull them slowly apart so you will get an arc.

With a ceramic cover for your furnace you can generate enough heat to melt metals and do many other interesting things.



pert on terrorism, since he wrote a book on the subject. Such experts may boast of having read more newspaper articles on terrorism than most people but that's about as far as it goes in practice. Since I've done considerably more than read about terrorists I'll review his book, "The War Against Terrorism".

"Neil Livingstone's book is fatuous drivel from front to back. In describing the terrorist element as such effective attention-getters, Livingstone teaches the violent and mentally unstable how to hold the Establishment at bay and at the same time gain the prestige such losers could never hope for using their inferior abilities legitimately. He graphically illustrates the techniques of misfits to create destruction far out of proportion to their miniscule numbers. Any lonely and alienated individual has but to read "The War Against Terrorism" to put himself and a few equally bitter and twisted acquaintances on the path of "resistance on behalf of The People". This book is dangerous. I do not think the First Amendment ought to protect those who write books encouraging disturbed people to act out paranoid rage and murder fantasies. I want this book banned".

Of course, I've not read his book, but he didn't read mine either. So, there.

Such books, however, can provide rationales for acts of destruction and cruelty by dissidents. They also tend to provide the dissident with a picture of himself as part of an intellectual elite. Another book I've read but will not name, could almost serve as a terrorists' recruiter's manual with such plaudits as, "Yet the terrorist mystique has considerable attraction for alert, intelligent, capable individuals of all age groups in many countries".

San Diego County's own Conrad Greyson bemoans the fate of the six kids in his area blown up each year. He says, "we always find these manuals". He didn't name mine but I'll bet he would have if he did. But he seems to blame the damage on the manuals instead of the kids, or their apathetic parents.

I liked his account of "raiding" the house of a 17 year-old who blew himself up with homemade explosives. Conrad seems to blame Desert's IMPROVISED MUNITIONS BLACK BOOK.

But he was a young man, old enough to join the Marines, with permission. Nor would he have necessarily gotten the idea from the book. Most likely

Continued on next page

Claim of Poisoning Stirs Debate on 'Mayhem Manuals'

Los Angeles Times
Thursday, August 25, 1988

By DENISE HAMILTON, *Times Staff Writer*

Oleander is a familiar sight to Southern Californians. A dark green shrub with pink, red or white flowers, it brightens up freeway landscapes and sprouts gaily in suburban back yards.

What is not as well known is that every inch of this photogenic plant harbors a hard-to-detect and potentially fatal poison for which there is no sure antidote.

Kurt Saxon knows. He wrote about the lethal properties of oleander in a sinister 1971 book called "The Poor Man's James Bond." The self-published text, which law enforcement officials have long deplored, tells readers how to kill people, commit arson and build bombs.

Earlier this year, both the ancient plant and the atomic-age book came under new scrutiny after witnesses at a preliminary hearing testified that Pasadena funeral home operator David Sconce said he had poisoned Burbank mortician Timothy Waters.

Waters, 24, died April 8, 1985, at Camarillo's Pleasant Valley Hospital. Until May, when toxicological tests turned up traces of oleander in Waters' blood and tissue, it had been thought that the 300-pound mortician died of natural causes brought on by obesity.

The Ventura County district attorney's office is reviewing the new evidence but has not determined whether to charge the 32-year-old Sconce in Waters' death. Sconce is awaiting trial in Pasadena Superior Court along with his parents, Jerry and Laurieanne Lamb Sconce, on 67 felony and misdemeanor charges regarding the operation of Lamb Funeral Home in Pasadena.

The charges range from mutilating corpses to selling body parts. David Sconce also faces charges of soliciting the murders of his grandparents and of a deputy district attorney who was the prosecutor in the preliminary hearing. The Sconces have denied all the charges.

Quest for Information

Nonetheless, the revelation of death by poisoning sent coroners, prosecutors and police investigators scurrying to learn more about the 12 or so known cases of oleander poisoning and to obtain copies of "The Poor Man's James Bond," which is not widely available but is stocked in some survivalist shops.

he had a well-formed idea and bought the book as a step in implementing his idea. At any rate, the book was not at fault. Pipe bombs are commonly shown on TV and are moron-simple. A book could only serve to add such safety features as my idea to put a plastic baggie in the pipe with its top pressed around the threads to prevent premature explosion through friction. The instructions could not have been faulty or lacking in proper cautionary procedures. Hadn't he already made 10 of them? Most likely he just got bored and careless.

And shouldn't Conrad be grateful that the jerk finally goofed? What would have happened if he had actually used those bombs? Think about that, Conrad, buddy.

So I conclude with SOF's own Jim Graves who judged my civic-mindedness in experimenting with poisons on winos as "sick". Relatives of a murdered woman were awarded nine million dollars because of an obvious this-gun-for-hire ad run by SOF. I think Jim is a little late in recognizing what sick is.

20/20 BLOWS BOMB BOOKS REPORT

THE GUN RUNNER 1986

by Kurt Saxon

On March 27 20/20 aired a segment on "Terrorist manuals". One obvious purpose was to expose and discredit the sellers of books on homemade weaponry as de-facto terrorists and heartless profiteers. Another object was to show that such material is a clear and present danger to society. 20/20 failed miserably on both counts.

20/20 obviously spent a great deal of time researching the subject. But when the theme is weapons of any kind, their liberal bias renders them helpless in a frenzy of hysterical inferences and name-calling.

Their first target was THE ANARCHIST COOKBOOK, compiled by William Powell. With its emphasis on narcotics and Powell's anti-establishment propaganda, it was the nearest 20/20 ever got to a terrorist manual.

One interviewee was Morris Litwak of The Larder, 11106 Magnolia Blvd., N. Hollywood, CA 91601. His main line is survival products but he stocks books on weaponry for those who would protect their goods from improvident looters all survivalists will have to contend with.

An interesting part and an endorsement of such books, especially mine, was a trip to drug and hardware stores by a 20/20 employee. She had a shopping list of ordinary items to be used for making bombs. Explosives expert, Jack McGeorge, assured 20/20 that her purchases would make explosives equivalent to five or six sticks of dynamite.

They next spent 35 seconds on the nut who threatened to blow up the Washington Monument four years ago. Patrolman Jim Powell, first officer to examine the truck believed to have been filled with explosives, said of such manuals: "It is a detriment to us. It's a detriment to all law enforcement officers and the general public as well". But there were no explosives in the truck and the event had no tie-in to books of any sort.

During my interview they had the camera on me for about 30 minutes as I discussed many aspects of the weapons book field. They cut my part down to 90 seconds. I told them my

It also raised concerns that texts such as Saxon's could prove dangerous in the hands of violent, mentally unstable individuals and sparked debate on censorship vs. freedom of the press.

Neil Livingstone, a Georgetown University professor who wrote "The War Against Terrorism," called Saxon's book "an atrocious piece of literature that serves no public interest." He wants it banned.

"Kurt's books teach people how to kill cops and teach children how to blow themselves up," he added. "I don't think the First Amendment ought to protect you if you write a book on how to murder someone."

Law enforcement officials dub books such as Saxon's "mayhem manuals" and say they often find such texts when they raid illegal explosives labs, drug labs and terrorist hide-outs. Although it is difficult to tie violent incidents directly to the books, police psychologists say the manuals are dangerous because they encourage disturbed people to act out paranoid rage and murder fantasies.

Lt. Don Beasley, who heads the Los Angeles Police Department's explosives squad, says criminals often photocopy and pass around pages of "The Poor Man's James Bond" and "The Anarchist Cookbook," another such tome that was popular in the 1960s.

The police say danger also arises because the books occasionally print inaccurate chemical formulas or do not indicate proper safety procedures. Livingstone said this is especially true of "The Poor Man's James Bond."

"We get an average of six kids a year who blow themselves up, and when we get to their house, we always find these manuals," said San Diego County Sheriff's Sgt. Conrad Grayson of the bomb and arson squad.

Last year, the squad raided an Escondido house after a 17-year-old boy blew himself up with homemade explosives. Ten pipe bombs and a how-to text titled "Improvised Munitions Black Book" were found.

Even those most staunchly committed to press freedom and the public's right to bear arms recoil at some aspects of Saxon's book, which includes a chatty section on how to test homemade poison concoctions on homeless winos.

"That's pretty sick," said Jim Graves, managing editor of Soldier of Fortune, the guns-and-adventure magazine.

Saxon claims his book has sold 60,000 copies, many via mail order. Few mainstream bookstores stock "The Poor Man's James Bond"; some bookshop owners interviewed say they don't want it on main purpose for publishing THE POOR MAN'S JAMES BOND, THE WEAPONEER and my books on self-sufficiency was money.

Of course I write and compile for money. An author and/or compiler hasn't arrived until he can make a living from the sale of his work to a satisfied market. But since they were unable to show me up as a radical pamphleteer turning out terrorist propaganda after a hard day's work as a dish washer, they meant to project me as an irresponsible profiteer.

Reaching, as 20/20 did to justify Powell's statements, 20/20 wasted a full two minutes recounting the case of Texan, John Chanslor, who tried to buy ricin from Minnery in 1982. It was a lurid case, but again had nothing to do with weapons books. Had Chanslor bought my WEAPONEER, made his own ricin and killed his wife, there would have been some justification for airing the case in conjunction with "terrorist manuals".

In a letter John Minnery wrote to me in 1982 concerning Chanslor, he told me Chanslor had contacted him through his publisher. Obviously, Chanslor had read one or more of Minnery's books but the ricin process isn't there. So the Chanslor spot on 20/20 was irrelevant concerning Minnery's or any other such books.

Moving on, 20/20 said, "Robert McBrian has been helping to coordinate the Federal Government's fight against terrorism for almost 15 years (With little if any success, I might add). He's one of Washington's most knowledgeable experts".

McBrian told 20/20, "We've had bombers who've admitted they have used the manuals in concocting their devices. Some of the literature has been found in a variety of the American terrorist type groups.

"There was a raid last year on the stronghold of the CSA, an extreme right radical organization. The compound had various booby-traps, weapons, illegal and otherwise, lots of explosives and manuals on the premisis on how to use the explosives and how to make explosives".

Since I'm quite familiar with the now defunct CSA (see page 81 of THE GUN RUNNER), I know that this reference, too, was irrelevant. Over the years the CSA had several demolitions and weapons experts, trained by the military. They never really needed such manuals. So Ellison bombed a fag church and a pipeline of some sort, as I remember. Any of several of his members could have built the bombs without referring to any manual.

The film footage 20/20 showed on the CSA ordnance contained no improvised weaponry or manuals on the subject. A copy of the PMJB was shown on the original film but had been purchased only a couple of months before the raid and so had not been used.

The CSA was a cult which, over the years, had collected weapons and explosives with great zeal. They didn't get their knowledge of weapons, improvised or otherwise, from our books. So the CSA's antics are also irrelevant to the question of our manuals being a detriment to society.

McBrian continued: "Juveniles are learning from this sort of thing. A substantial number of explosives incidents that are investigated every year by Federal Agents and by local authorities involve accidents. Unfortunately, many of these accidents are by curiosity seekers and the interested juveniles who decide they are going to see if they can make themselves a bomb; see if they can make something go boom. And it's very tragic".

Tragic, yes. But what about parental supervision? And how many such tragedies happened to ignorant youngsters trying to recreate a bomb from a TV show as opposed to our books? Only the inference is there.

A few weeks previous to the airing of the "terrorist manual" segment, 20/20 did a piece on a psychotic doctor convicted of poisoning seven of his patients. He had also tried to kill his co-workers with iced tea laced with ant

their shelves.

'Russians and Martians'

"I'm torn two ways. It's a free speech issue on one hand and deplorable on the other," said Dosier Hammond, the former president of the Southern California Booksellers' Assn. and the trade-book manager at the UCLA student bookstore, which does not carry the book.

Saxon, a folksy 56-year-old who lives in Harrison, Ark., and publishes survivalist books says with glee that his book will come in handy "when the Russians and Martians invade."

Saxon has deleted the oleander poison entry in his "New Improved Poor Man's James Bond" because, he said, "it wasn't fanciful enough."

The section originally read: "Oleanders are common flowers but are about as poisonous as any plant. The heart is affected very quickly and severely. Both the branches and the leaves are lethal."

Experts say only a fraction of oleander poisonings, whether accidental or intentional homicides, are reported. Dr. Fredric Rieders, a forensic toxicologist with National Medical Services in Philadelphia, said children, in particular, are susceptible to oleander poisoning because they put things in their mouths.

Rieders said symptoms include vomiting, diarrhea, indigestion and a contracting of the heart until the muscle cramps cause the blood to stop flowing, which can result in death.

"Once the poisoning has occurred, it is extremely difficult to counteract it. It is mostly in God's hands," Rieders said.

A minuscule amount of the plant is enough to be fatal, experts said.

Dr. F. Warren Lovell, Ventura County's coroner, says he knows of two oleander poisoning cases—one in which a 96-year-old woman in Northern California committed suicide by eating oleander leaves and a case in which a Haitian herb doctor in Florida prescribed oleander tea for ailing patients and accidentally killed one.

Then there are the unconfirmed tales, such as the one about the Boy Scout who barbecued a wiener on an oleander branch and died.

Waters, who ran the Burbank-based Alpha Society, a cremation service, died in agony after two days of bloody vomiting and diarrhea at the Camarillo house of his mother, Mary Lou Waters. An autopsy performed by the Ventura, poison.

Copies of the PMJB and THE WEAPONEER were shown among his effects, along with various poisons. But he was a doctor, with the training and with easy access to many poisonous substances. I've never written about ant poison and the deaths of his seven victims were not described as a result of anything he had read in my books. But again, there were my books, there were some bodies, but no direct connection.

For such a prestigious program as 20/20 to raise an alarm about our "manuals for mayhem", "terrorist literature", etc., without one clearcut example is shameful. And if McBrian is such an expert and so close to the subject and so willing to collaborate with 20/20, why couldn't he have supplied them with at least one irrefutable example?

I've sold over 50,000 copies of the PMJB. Paladin published 300,000 weapons and related books last year alone, and with Loompanics, Delta, Desert, Alpha, etc.; millions over the years. On the surface, this should be alarming. But where are the body counts? Where are the examples of crimes which would not have been committed without such literature?

What with the hostility shown us by the media it would be reasonable to expect them to rub our noses in actual examples if they had them. A few years ago a man answered a classified ad in SOLDIER OF FORTUNE, became a mercenary, went to Africa and got captured and was executed. The media had a field day. "The man would be alive today except for SOLDIER OF FORTUNE", they all said. (The man was an adult and responsible for his actions. SOF was blameless).

Recently, SOF ran an ad by a man in an American prison who wanted to hire mercenaries to help him escape. The ad was answered and four or five mercenaries joined him in prison. Again, a media barrage of accusations against SOF.

So if Johnny, due to a lack of parental supervision, is found with his hands and face blown off and one of our manuals glued to the ceiling with his blood, can anyone doubt the media reaction? Or if tomorrow a terrorist begins throwing bombs he could not have made without one of our books, will not the media lay the blame at the publisher's door as they did with SOF?

Although we can't be expected to act as surrogate parents or public guardians anyway, 20/20 showed an extreme lack of professionalism and future credibility in accusing us of contributing to violence, using nothing but inference and innuendo. Where is the journalism of Joseph Pulitzer? Where are the objective investigative reporters?

The 20/20 staff sought to expose our field, hoping to find trails littered with the bodies of innocents leading to our firms. No bodies. They may have hoped to show a scroungy band of anti-social, murderous nihilists fomenting revolution and terrorism wherever they could. Instead, they found only well-educated, cleancut authors and publishers, unaffiliated with any radical groups and with not a terroristic aim among us.

You might wonder why the media so fears and hates us that they would strike out so blindly. I have a theory you might consider. For years, the liberal news media has been pushing their cameras into the faces of every violent mediocrity screaming, "Down with America!"

The media has consistently furthered the causes of the weak minded and destructive "disadvantaged" of every race, creed and color. They have encouraged the entry into our country of millions of illegal aliens; diseased, criminal, illiterate and perverse. Our streets are filled with savages who rape, rob, maim and kill, almost with impunity.

Having destroyed our republic and undermined their own democracy, they fear the violence and terrorism they themselves have nurtured. Yet, as the scorpion who stung to death the frog carrying him across the stream, because it was his nature, they follow their own natures still.

County Coroner's office said Waters died of natural causes, compounded by his extreme obesity and fatty deposits in his liver.

Some authorities today question that conclusion and say the coroner should have carried out toxicological tests.

"The autopsy looked real funny to me," said Walt Lewis, the deputy district attorney in Pasadena who initially handled the Sconce case, but was removed after Sconce was accused of soliciting his slaying.

"Here's a guy who's 24 and weighs 300 pounds, and he died of fatty deposits in the liver?" Lewis asked rhetorically.

Lovell, who became Ventura County's coroner in late 1985, said the previous coroner indicated he planned to perform toxicological tests. But Lovell said he left the post in July, 1985, without doing so.

Both Lovell and others point out that standard toxicological tests would not have turned up the presence of oleander, however, because it requires a specific test.

"If you don't suspect oleander, it would be way down on your list of things to look for," Rieders said.

It wasn't until this year that the authorities began to suspect foul play. During an 8-month hearing in Pasadena Superior Court, witnesses testified that Sconce hired two men to beat up Waters on Feb. 12, 1985.

David Edwards, a former Lamb employee, testified that Sconce borrowed the Saxon book to learn how to poison a neighbor's dog.

Witnesses said that in March Sconce went to a Simi Valley restaurant where Waters was eating and told witnesses that he dropped poison into Waters' mixed drink when he left the table.

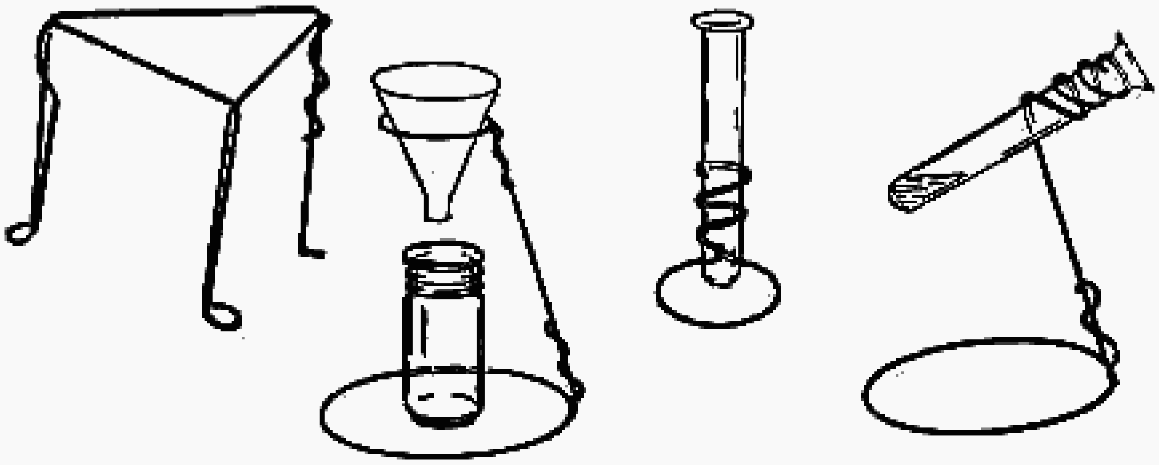
The motive, according to witnesses, was that Sconce wanted to silence Waters because the Burbank mortician suspected that Lamb Funeral Home was conducting illegal, multiple cremations.

One cellmate testified that the poison was not strong enough, so Sconce poisoned Waters again, causing a heart attack. Cellmates testified that Sconce bragged about poisoning Waters.

The Ventura County district attorney's office said it probably will not decide whether to file murder charges against Sconce until September, because the prosecutor reviewing the evidence is on vacation.

CLOTHES HANGER STANDS

A pair of needle-nosed pliers and a pair of regular pliers and a few clothes hangers will allow you to make ever so many different pieces of lab equipment, as shown.



PRUSSIC ACID

Prussic, or hydrocyanic, acid is one of the most poisonous compounds known. A student once described it as being so poisonous that a drop on the tongue of a dog is enough to kill a man. Nazis and Communists used to murder each other with it before Hitler came to power.

It is shot from a water pistol into the victim's face. The victim automatically gasps in surprise and droplets of the acid are drawn up the nose to the olfactory nerves. Before he realizes he has been attacked he is unconcious. Within three minutes of his collapse he is dead.

A few drops in the mouth is also fatal. So just consider that if a man is shot in the face with prussic acid he will drop dead before he can move ten feet.

The attacker usually hides the water pistol in a folded newspaper and shoots the victim in the face while passing him on the street or on a staircase. The victim stops in surprise and collapses and dies of an apparent heart attack. The attacker simply keeps on going and passersby gather to gawk and discuss their own coronaries. I think it would be great fun to watch what would happen to some poor son of a bitch who tried to give the victim mouth-to-mouth resuscitation.

Small batches of prussic acid are made with your still. The ingredients needed are 15 parts of potassium ferrocyanide, nine parts of distilled water, nine parts of strong sulfuric acid and five parts of calcium chloride. The calcium chloride can be bought or it can be made by covering broken up bits of blackboard chalk with hydrochloric acid and letting it soak in well and then drying it.

To start the process, put the potassium ferrocyanide into the flask first. Then put in the water and swirl the flask to mix both ingredients well. Next, the sulfuric acid is poured in, slowly, and the mess is well stirred with a glass rod or tube.

The calcium chloride, in coarse fragments, is put into the receiving bottle and a two hole stopper is put in with a tube leading outside.

Measurements are by weight. Consider the parts as ounces. Depending on the size batch you need, the measurements are cut in half until you reach the quantity you want. Below are four sample size batches starting with 15 parts, or ounces, and going down the scale to one and seven-eighths parts, or ounces. Measuring parts is easy once you get the hang of it.

SAMPLE BATCHES:	1	2	3	4
Potassium ferrocyanide	15 oz.	7½ oz.	3¾ oz.	1 7/8 oz.
Distilled water	9 oz.	4½ oz.	2¼ oz.	1 1/8 oz.
Sulfuric acid	9 oz.	4½ oz.	2¼ oz.	1 1/8 oz.
Calcium chloride	5 oz.	2½ oz.	1¼ oz.	5/8 oz.

If you lack a lab scale you can measure with plastic cups on a $3.00 postage scale bought at any office supply store. To do this, say you have a 500 ml flask and want the smallest batch, batch four.

You first put a plastic cup on the postage

of the peroxide, the residual weight of it shows at once the quantity expended. The operation may be always completed in five minutes, for the red precipitate dissolves as rapidly in the dilute prussic acid, with the aid of slight agitation, as sugar dissolves in water. Should the presence of muriatic acid be suspected, then the difference in the volatility of prussiate and muriate of ammonia may be had recourse to with advantage; the former exhaling at a very gentle heat, the latter requiring a subliming temperature of about 300° Fahr. After adding ammonia in slight excess to the prussic acid, if we evaporate to dryness at a heat of 212°, we may infer from the residuary sal-ammoniac the quantity of muriatic acid present. Every grain of sal-ammoniac corresponds to .6822 grains of muriatic acid.

Encyclopedia Britannica, 1892

PRUSSIC ACID, the familiar name for a dangerously poisonous, though chemically feeble, acid, known scientifically as "hydrocyanic acid," or "cyanide of hydrogen," is here taken as a convenient heading under which to treat of cyanides generally. This generic term (from κύανος, blue) is not meant to hint at any generic property; it is due simply to the fact that all cyanides, in an historical sense, are derivatives of a blue pigment which was discovered accidentally by Diesbach, a Berlin colourmaker, about the beginning of the 18th century.

The foundations of our present knowledge of cyanides were laid by Scheele (1783), whose discoveries were subsequently (from 1811) confirmed and supplemented, chiefly in the sense of quantitative determinations, by Gay-Lussac. Although we have no space for further historical notes, we must not omit to state that Gay-Lussac, as one result of his work, conceived and introduced into chemistry the notion of the "compound radical," having shown that prussic acid and its salts are related to the group NC in precisely the same way as chlorides are to chlorine, or sulphides to sulphur. This idea, in his own eyes and in those of his contemporaries, was greatly fortified by his success in even isolating his "cyanogène" as a substance.

In preparing cyanogen or cyanides in the laboratory the operator now always starts from prussiate of potash, with which, accordingly, we begin.

Prussiate of Potash, $(NC)_6Fe.K_4+3H_2O$ (syn. ferrocyanide of potassium; Germ. *Blutlaugensalz*).—This salt is being produced industrially from animal refuse (hide and horn clippings, old shoes, blood solids, &c.), carbonate of potash, and iron filings or borings as raw materials. The carbonate of potash is fused at a red heat in an iron pear-shaped vessel suspended within a furnace, or on the cupel-shaped sole of a reverberatory furnace, and the animal matter, which should be as dry as possible, is then introduced in instalments along with the iron. The fusion is continued as long as inflammable gases are going off; then the still fluid mass is ladled out and allowed to cool, when it hardens into a black stone-like body known to the manufacturer as "metal." When the broken-up metal is digested with water in an iron vessel prussiate of potash passes into solution, while a black residue of charcoal, metallic iron, sulphide of iron, &c., remains. The clarified solution, after sufficient concentration in the heat, deposits on cooling part of its prussiate in lemon-yellow quadratic crystals (generally truncated octahedra), which are purified by recrystallization. The last mother-liquors furnish an impure green salt, which is added to a fresh fuse and so utilized.

In former times it was believed that the prussiate was produced during the fusion process, and in the subsequent process of lixiviation simply passed into solution, until Liebig showed that this view was untenable. The fuse cannot contain ready-formed prussiate, because this salt at a red heat breaks up with formation of a residue of carbide of iron and cyanide of potassium. The metal in fact when treated with dilute alcohol gives up to it plain cyanide of potassium, and the fully exhausted residue yields no prussiate on treatment with water. The prussiate accordingly must be produced during the process of lixiviation by the action of the cyanide of potassium on some ferrous compound in the metal. Liebig thought that it was partly the metallic iron, partly the sulphide of iron present in the metal, which effected the conversion. According to more recent researches a double sulphide, $K_2S+Fe_2S_3$, which is always produced during the fusion (from the reagents proper and the sulphur of the organic matter and that of the sulphate of potash present in the carbonate as an impurity), plays this important part. The double sulphide by the action of water breaks up into alkaline sulphide, sulphide of iron (FeS), and sulphur. This sulphide of iron is of a peculiar kind; it does what *ordinary* FeS does not effect, readily at least: it converts the cyanide into prussiate, thus, $6NC.K+FeS=K_2S+(NC)_6Fe.K_4$, while the eliminated sulphur of the original Fe_2S_3 unites with another part of the cyanide of potassium into sulphocyanate, $S+NCK=SNC.K$, which latter salt is thus unavoidably produced as a (rather inconvenient) bye-product. Pure prussiate of potash has the specific gravity 1·83; it is permanent in the air. It loses its water, part at 60° C., the rest at 100° C., but very slowly. The anhydrous salt is a white powder. The crystals dissolve in four parts of cold and in two parts of boiling water. It is insoluble in, and not dehydrated by, alcohol.

Prussiate of potash has the composition of a double salt, $Fe(NC)_2+4KNC$, but the idea that it contains these two binary cyanides is entirely at variance with its reactions. Cyanide of potassium is readily decomposed by even the feeblest acids, and to some extent even by water, with elimination of hydrocyanic acid, and on this account perhaps is intensely poisonous. A solution of the prussiate remains absolutely unchanged on evaporation, and the action on it even of strong acids in the cold results in the formation of the hydrogen salt, $(NC)_6FeH_4$, which is decomposed, it is true, but only when the mixture is heated, with evolution of hydrocyanic acid. It is not poisonous. Its solution when mixed with nitrate of silver does not give a precipitate of cyanide of silver, NC.Ag, and a solution of the two nitrates; but yields a unitary precipitate of the composition $(NC)_6Fe.Ag_4$, which contains all the iron; only nitrate of potassium passes into solution. Other heavy metallic salts behave similarly. On the strength of these considerations chemists, following the lead of Liebig, view prussiate as a binary compound of potassium, K_4, with a complex radical, N_6C_6Fe, "ferrocyanogen."

Hydrocyanic Acid, NC.H.—This acid is prepared most conveniently from prussiate of potash. Wöhler recommends the following method. Ten parts of powdered prussiate are placed in a retort, the neck of which is turned upwards, and a (cooled down) mixture of seven parts of oil of vitriol and fourteen parts of water is then added. If the aqueous acid is wanted, the exit-end of the retort is joined on direct to a Liebig's condenser, which must be kept very cool by a current of cold water. If the anhydrous acid is desired, two wide-necked bottles (or two large U-tubes) charged with fused chloride of calcium and kept at 30° C. by immersion in a water bath of this temperature, must be inserted between the retort and condenser. In this case more particularly it is indispensable to provide for a most efficient condensation of the vapours; the exit-end of the condenser should be provided with an adapter going down to near the bottom of the receiver, which must be surrounded by a freezing mixture. The temperature of the latter, of course, must not be allowed to fall to the freezing-point of the distillate. The retort is heated by means of a sand bath and a brisk distillation maintained until the residue begins to dry up. The result of the reaction is in accordance with the assumption that the dilute vitriol, in the first instance, converts the prussiate, one-half into $(NC)_6Fe.H_4$, the other into $(NC)_6Fe.K_2H_2$, and that through the effect of the heat these two bodies decompose each other into $\{(NC)_6Fe\}K_2Fe$, which remains in the residue as a precipitate, and $(NC)_6H_6=6NCH$, which distils over. Real NCH is a colourless liquid of 0·6967 specific gravity at 18° C., which freezes at −15° C. (Gay-Lussac) into a white fibrous solid. According to Schulz the acid, if really pure, remains liquid at −37° C. It boils at 26°·5 C.; at 4°·5 its vapour-tension already amounts to half an atmosphere. The vapour is inflammable and burns into carbonic acid, water, and nitrogen. The acid mixes with water in all proportions, with contraction and yet absorption of heat. The solution behaves on distillation like a mere mechanical mixture of its two components. Prussic acid has a very peculiar powerful smell; more characteristic still is a kind of choking action which even the highly attenuated vapour exerts on the larynx. Prussic acid is fearfully poisonous; a few drops of even the ordinary pharmaceutical preparation (of 2 per cent.) are sufficient to kill a large dog. It acts with characteristic promptitude, especially when inhaled as a vapour. Even a relatively large dose, if it has once found its way into the stomach without producing a fatal effect, is said to do relatively little harm there.[1]

Prussic acid is characteristically prone to suffer "spontaneous decomposition." Whether the *pure* anhydrous acid really is, in the strictest sense of the word, still requires to be found out; the ordinary preparation, when kept in a close bottle, soon turns brown and turbid from "azulmic" acid, a substance of complex constitution. Other things are formed at the same time. The *pure* aqueous acid is liable to similar changes; in its case formiate of ammonia always forms the predominant product. This change is easily understood—

$$\mathrm{NC.H} + 2\mathrm{H_2O} = \underset{\text{Ammonia.}}{\mathrm{NH_3}} + \underset{\text{Formic acid.}}{\mathrm{H.COOH}}.$$

A strong aqueous prussic acid, when mixed with fuming hydrochloric acid, is soon converted into a magma of crystals of sal-ammoniac, with formation of formic acid, which remains dissolved. And yet, most singularly, the addition to the preparation of a small proportion of hydrochloric or sulphuric acid is the best means for preventing, or at least greatly retarding, its spontaneous change in the very same direction. Aqueous prussic acid acts only very feebly (if at all) on blue litmus; it combines with aqueous caustic alkalis but does not decompose their carbonates; nor does it act upon the generality of insoluble basic metallic oxides or hydrates; mercuric oxide and oxide of silver form noteworthy exceptions to this rule.

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[1] The *British Pharmacopœia* prescribes for the medicinal acid a strength of 2 per cent. of real NCH. The two medicinal preparations known as *aqua amygdalarum amararum* and as *aqua laurocerasi* respectively contain prussic acid in combination with hydride of benzoyl, $C_6H_5.COH$. In neither case does the prussic acid pre-exist in the vegetable materials, but is produced during the mashing process which precedes the distillation, by a fermentative decomposition of the amygdalin which they contain.

LAUGHING GAS

Ammonium Nitrate
See Page 104

Laughing gas was one of the earliest anaesthetics. After a little while of inhaling the gas the patient became so happy he couldn't keep from laughing. Finally he would drift off to a pleasant sleep.

Some do-it-yourselfers have died while taking laughing gas. This is because they had generated it through plastic bags while their heads were inside. They were simply suffocating but were too bombed out to realize it.

The trick is to have a plastic clothes bag in which you generate a lot of the gas.Then you stop generating the gas and hold a small opening of the bag under your nose, getting plenty of oxygen in the meantime. Then, Whee!

To make it you start with ammonium nitrate bought from a chemical supply house or which you have purified with 100% rubbing or wood alcohol.

First, dissolve a quantity of ammonium nitrate in some water. Then you evaporate the water over the stove, while stirring, until you have a heavy brine. When nearly all the moisture is out it should solidify instantly when a drop is put on an ice cold metal plate.

When ready, dump it all out on a very cold surface. After a while, break it up and store it in a bottle.

A spoonful is put into a flask with a one-hole stopper, with a tube leading into a big plastic bag. The flask is heated with an alcohol lamp.

When the temperature in the flask reaches 480 F the gas will generate. If white fumes appear the heat should be lowered as the stuff explodes at 600 F.

When the bag is filled, stop the action and get ready to turn on.

Dick's, 1872

4060. Protoxide of Nitrogen. This gas is also called *nitrous oxide,* and is largely used by inhalation, under the name of *laughing gas,* to produce insensibility to pain. It is colorless, possesses an agreeable odor, and a sweetish taste. At 45° Fahr., and under a pressure of 50 atmospheres, it is liquid. Its specific gravity is 1.5241; it supports combustion, and is absorbed by water. Its most remarkable property is its action on the system when inspired. A few deep inspirations are usually succeeded by a pleasing state of excitement, and a strong propensity to laughter and muscular exertion, which soon subside, without being followed by languor or depression. Its effects, however, vary with different constitutions.

4061. To Prepare Laughing Gas. Evaporate a solution of nitrate of ammonia until a drop of the fused mass placed on a cold plate instantly solidifies; cool, break the lump into pieces, and place it in a stoppered bottle. For use, a portion is introduced into a glass retort, and heat applied by means of a spirit lamp. As soon as the heat reaches 480° Fahr., protoxide of nitrogen is evolved, and may be collected in bladders, gas bags, a gasometer, or in the pneumatic trough over warm water. (*See No.* 4031.) Should white fumes appear within the retort after the evolution of the gas has commenced, the heat should be lowered, as, when heated to about 600°, nitrate of ammonia explodes with violence. Nitrous oxide may also be made in the same way from crystallized nitrate of ammonia, or by exposing nitric oxide for some days over iron filings, but it requires great care in its preparation.

4062. Test for Pure Laughing Gas. When pure, it is colorless, has an agreeable odor, and does not affect a solution of nitrate of silver.

Sollmann's Manual of Pharmacology, 1917

NITROUS OXID

General Statement.—Nitrous oxid, N_2O, nitrogen monoxid or protoxid, "Laughing Gas," was the first of the inhalation anesthetics and is still the safest. When inhaled undiluted, it produces very rapidly unconsciousness and anesthesia, partly by a direct narcotic action, and partly by exclusion of oxygen. The asphyxia limits its use to very short operations, such as the extraction of teeth. It has the advantages of prompt action and recovery, absence of irritation and of after-effects, and is practically devoid of danger. By the addition of oxygen, the asphyxial factor may be removed. The anesthesia also becomes slower and lighter; but by carefully adjusting the percentage of oxygen (5 to 10 per cent.), a satisfactory degree of surgical anesthesia can be maintained for long periods, without letting the asphyxia obtain dangerous proportions. Nitrous oxid is especially valuable in the "Gas-Ether Sequence," by avoiding the unpleasant features of the induction of ether anesthesia.

Inhalation of Undiluted N_2O.—For short operations, as in dentistry, the gas is administered through a tight-fitting mask, so that all air is excluded. The symptoms run a very rapid course: the *preliminary effects* consist in a sweetish taste; numbness; exhilaration (laughter); confusion; deeper and quicker respiration; and fuller pulse. *Partial anesthesia*, with loss of consciousness, ensues in twenty to thirty seconds. The patient is subject to dreams and the anesthesia is imperfect. The reflexes are preserved and excitement may be present, especially if the patient is disturbed. The respiration is still regular, deep and quickened; the pulse full and rapid; the pupils enlarged; the face dusky, livid or pallid; the eyelids twitching and slightly separated. *Complete anesthesia* occurs in fifty to one hundred and twenty seconds, averaging fifty-six. Its onset is denoted by a change in the respiration, which becomes slightly irregular and noisy. The pulse is quickened by about 30 per cent. and is small. The blood pressure shows a large asphyxial rise (Kemp, 1897). The vasoconstriction diminishes the urine flow. The limbs are relaxed, but individual muscles exhibit clonic or epileptiform contractions. The pupils are almost invariably dilated. The face is cyanosed. Relaxation of the sphincters occurs rarely.

Operative Period.—As soon as this stage is reached, the gas is removed. The pulse at once becomes slower and fuller; the respiration also recovers rapidly; and the asphyxial symptoms disappear. The anesthesia lasts some twenty-two to thirty seconds after the gas is removed; and it is during this period that the operation must be performed. The total time between the beginning of the administration and complete recovery is therefore one hundred to one hundred and twenty seconds. The duration of the after-anesthesia increases with the duration of the administration. This may be prolonged to several minutes by giving the patient an occasional breath of pure air (every fifth inhalation); or by admitting a little air into the mask. The admission of air, however, makes the anesthesia uneven and unsatisfactory.

After-effects are generally absent with short administrations. Sometimes the patients complain of giddiness, headache, lassitude and drowsiness. Nausea is exceptional.

Accidents.—With short administrations, these are very rare, because of the wide margin between the first danger sign (noisy and irregular respiration) and death. Only about seventeen deaths have been reported, making the fatality less than 1 in 5,000,000.

KNOCKOUT DROPS

The first process for making chloral hydrate (knockout drops) is from Dick's formulary, 1872.

4276. Chloral. Chloral is an oily liquid, possessing an ethereal smell; it is soluble in alcohol, ether, and water, but its solution in the latter rapidly changes into a semisolid crystalline mass of *hydrate* of *chloral*, soluble in a larger quantity of water. Chloral boils at 202°, and has a specific gravity of 1.502.

4277. To Obtain Chloral. Place anhydrous alcohol in a tubulated retort, and pass dry chlorine gas through it, at first in the cold, but afterwards with the application of a gentle heat. As soon as the chlorine passes undecomposed through the liquor at the boiling temperature, the process is complete. On cooling, the liquid in the retort solidifies, forming a crystalline mass of hydrated chloral. This must be melted by gentle heat, and agitated with thrice its volume of oil of vitriol, when, on increasing the heat a little, an oily stratum of impure chloral will rise to the surface. This must be removed, boiled for some time, to drive off some free hydrochloric acid and alcohol, and next distilled with an equal volume of oil of vitriol; lastly, it must be rectified from finely-powdered quicklime, stopping the process as soon as the surface of the lime becomes dry. The chlorine is best introduced by a tube inserted into the tubulature of the retort, and a long tube, bent upwards, should be connected with the beak to convey away the hydrochloric acid gas extricated, and to allow the volatilized alcohol and chloral to condense and flow back into the retort.

Knockout drops are usually given to someone when he is a little drunk. After fifteen minutes he is out for the night.

Chloral hydrate was used as a sedative in a dose of 0.6 gram. It is seldom used now and is hard to get. For those who know chemistry and would like to make it I include the formula.

The chemicals needed are bleach, Sani-Flush, ethyl alcohol, sulfuric acid and calcium oxide.

You will need pure alcohol so buy a fifth of 100 proof vodka. This is 50% alcohol so distill it off and you should have just a little over 12 ounces.

The equipment needed is the still, the chlorine bottle, some pieces of glass tubing, rubber tubing, a 600 ml beaker, a water glass, an aquarium aerator and a basting syringe and a cooking thermometer, both from the dime store.

A piece of glass tubing is fitted into the bottom of the stopper for the flask. To it is fitted an eight-inch length of rubber tubing and at the end of this is the aerator. Two more pieces of glass tubing are put into the top of the stopper and the rest of the equipment is set up as illustrated.

To begin, put 12 ounces of alcohol in the flask. Put two inches of bleach and a teaspoonfull of Sani-Flush in the chlorine bottle.

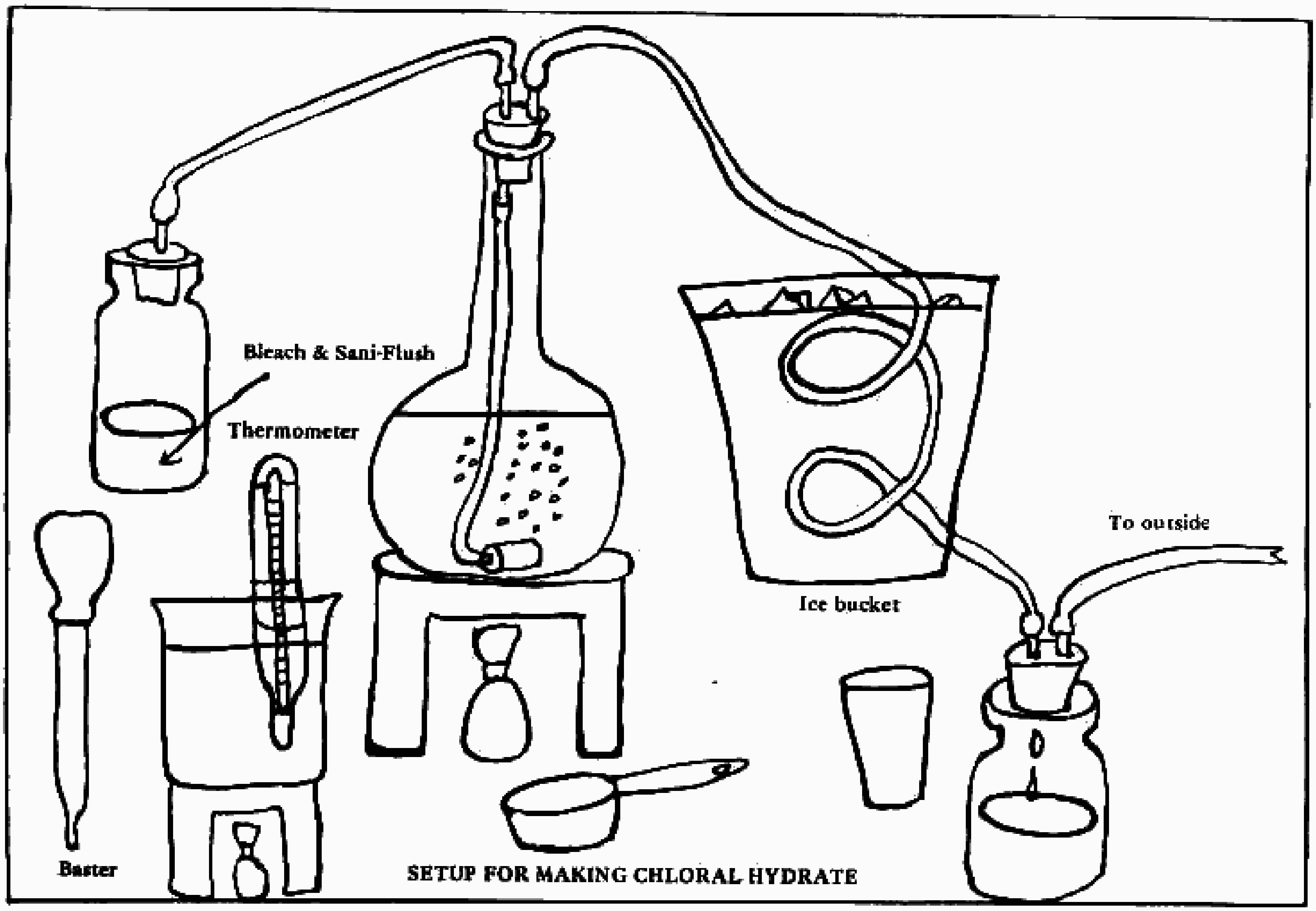
Start the chlorine through the alcohol while the flask is cold. Watch the flask carefully to see when the alcohol stops absorbing the chlorine. Then light the alcohol lamp with its wick turned down or with the stand on blocks so only a gentle heat will be made. When the alcohol stops absorbing again, raise the heat.

Keep this up until the alcohol is boiling. Finally it will no longer pick up any chlorine. Then, this part of the process is finished.

Some of the alcohol will have distilled off. It will go into the collecting bottle while the waste chlorine gas goes outside. Several times during the process, this alcohol is poured back into the flask.

When the alcohol is totally chlorinated the contents of the flask is poured into a porcelain pan and allowed to cool. If you have done it right the cooled product should be a crystaline mass of unrefined chloral hydrate.

Then, strong sulfuric acid, three times the volume of the chloral hydrate, is slowly poured into the pan. The pan is then put on the



SETUP FOR MAKING CHLORAL HYDRATE

stove over a gentle heat.

When the chloral hydrate is melted, it and the sulfuric acid are stirred thoroughly and part of the mixture is poured into the 600 ml beaker and put over the alcohol lamp. Don't let the mixture in the beaker get over 200 F as it will begin to boil away at 210 F. This is where the thermometer comes into play.

As the mixture heats up, the still impure chloral hydrate will rise to the surface in the beaker. When it stops rising, take the basting syringe and collect it off the top of the sulfuric acid. It doesn't matter if you pick up a little sulfuric acid as long as you get all the chloral hydrate. Store it in the water glass.

Repeat the last process until the pan is empty.

The still impure chloral hydrate is then put into the beaker. Then it is heated at about 190 degrees F for 20 minutes to drive off all the unchlorinated alcohol and hydrochloric acid.

The next step is to pour the chloral hydrate back into the flask and add an equal amount of sulfuric acid. The contents are then swirled around to mix.

The chloral hydrate is then distilled out of the sulfuric acid. This is easy to do as chloral hydrate boils at 210 F and sulfuric acid boils at 722 F.

When the distilling is over the sulfuric acid is poured out and the flask is washed and dried. Then finely powdered calcium oxide, equal in volume to the chloral hydrate, is put into the flask. The chloral hydrate is then added and distilled again. The process is stopped as soon as the chloral hydrate has nearly stopped dripping into the collecting jar and the surface of the calcium oxide is dry.

To prepare for use, add to the finished chloral hydrate, one part of water to two parts, by volume, of the finished product.

Chloral hydrate is a hypnotic and many people become addicted to it. Taking it yourself is a no-no.

This process has proven difficult for some. It does work, however. But if you have trouble with it, study Dick's process (4276-7) and the directions given in the 1892 edition of The Encyclopedia Britanica, below.

CHLORAL, **Trichloraldehyde**, or **Hydride of Trichloracetyl**, C_2Cl_3OH or $CCl_3.COH$, a substance discovered by Liebig in 1832, and further studied by Dumas and Städeler. It is a heavy, oily, and colourless liquid, of specific gravity 1·518 at 0° C., and boiling point 94°·4 C. It has a greasy, somewhat bitter taste, and gives off a vapour at ordinary temperature which has a pungent odour and an irritating effect on the eyes. The word *chloral* is derived from the first syllables of *chlorine* and *alcohol*, the names of the substances employed for its preparation. Chloral is soluble in alcohol and ether, in less than its own weight of water, and in four times its weight of chloroform; it absorbs but is not acted upon by chlorine, and dissolves bromine, iodine, phosphorus, and sulphur. Chloral deliquesces in the air, and, like aldehyde, is converted by water into a hydrate, with evolution of heat; it combines also with ethylic alcohol and its homologues, and the derived mercaptans. An ammoniacal solution of nitrate of silver is reduced by chloral; sulphites of the alkalies form with it crystalline compounds; and nascent hydrogen, by replacing its three atoms of chlorine, converts it into aldehyde (Personne, *Ann. Ch. Pharm.*, clvii. 113). By means of phosphorus pentachloride, chlorine can be substituted for the oxygen of chloral, the body $CCl_3.CCl_2H$ being produced; an analogous compound, $CCl_3.C(C_6H_5)_2H$, containing the radicle phenyl in the place of the oxygen, is obtained by treating chloral with benzene and sulphuric acid. With an alkali, chloral gives chloroform and a formate of the base according to the reaction $CCl_3.COH + KHO = CCl_3H + H.CO(OK)$; it is converted by oxidizing agents into trichloracetic acid $CCl_3.CO(OH)$; and forms with cyanic acid the body $C_5H_3Cl_6NO_3 = (CCl_3.COH)_2 \cdot COHN$. When kept for some days, as also when placed in contact with sulphuric acid or a very small quantity of water, chloral undergoes spontaneous change into the polymeride *metachloral*, $C_6H_3Cl_9O_3 = (C_2Cl_3OH)_3$, a white porcelaneous body, slowly volatile in the air, insoluble in water, alcohol, and ether, and reconverted into chloral without melting at 180° C.

Chloral is prepared by passing dry chlorine into absolute alcohol; the latter must be cooled at first, but towards the end of the operation has to be heated nearly to boiling. The alcohol becomes converted finally into a syrupy fluid, from which chloral is procured by treatment with sulphuric acid. The action of chlorine upon alcohol is complex;—first aldehyde, $CH_3.COH$, is produced, which combines with alcohol to form acetal, $CH_3.CH(OC_2H_5)_2$; this, acted on by chlorine, yields trichloracetal, $CCl_3.CH(OC_2H_5)_2$, which is converted by the hydrochloric acid present into chloral alcoholate, $CCl_3.CH.OH.OC_2H_5$, and monochlorethane, C_2H_5Cl. The latter body is also formed directly from alcohol, in the process for the manufacture of chloral, and combines with aldehyde, giving monochlorinated ethylic ether, $CH_3CHCl.OC_2H_5$, which is converted by chlorine into tetrachlorinated ether, $CCl_3.CHCl.OC_2H_5$. By the action of sulphuric acid, chloral alcoholate and tetrachlorinated ether are resolved into alcohol and chloral, and monochlorethane and chloral, respectively. The crude chloral is distilled over lime, and is purified by further treatment with sulphuric acid, and by redistillation.

A mixture of starch or sugar with manganese peroxide and hydrochloric acid may be employed instead of alcohol and chlorine for the manufacture of chloral (Städeler, *Ann. Ch. Pharm.*, lxi. 101–121). An isomer of chloral, *parachloralide*, is made by passing excess of dry chlorine into absolute methylic alcohol; it is a colourless liquid, insoluble in water, and boils at 182° C. (Cloëz, *Ann. Ch. Pharm.*, iii. 180).

Chloral hydrate, $C_2Cl_3OH.H_2O$, or $CCl_3.CH(OH)_2$, the compound formed by the union of water with chloral, occurs in the form of oblique, often very short, rhombic prisms; an acicular form of crystals is considered by Paul to be characteristic only of the alcoholate. The purest samples of chloral hydrate present the appearance of ordinary alum broken into fragments, are perfectly transparent, only slightly odorous, free from powder, and dry to the touch, and do not become white by exposure. Jacobsen gives the melting point of pure chloral hydrate as 50° to 51°, the boiling point as 99° C. It can be distilled unchanged at 120°C.; but when heated with sulphuric acid it is converted into anhydrous chloral and *chloralide*, $C_5H_2Cl_6O_3$. When mixed with water, chloral hydrate causes a considerable degree of cold; and, as with camphor, small fragments of it placed on the surface of water exhibit gyratory movements. An aqueous solution should be neutral or nearly so, and should give but a faint milkiness when boiled with silver nitrate. A drop or two of ammonia added to solutions assists in their preservation. Chloral hydrate may be detected in the presence of other substances by adding an alkali and heating, when chloroform is evolved, which may be collected in a receiver; this process can be employed for the estimation of the commercial hydrate. When ammonium sulphide is added to a solution of pure chloral hydrate, the liquid turns red, and then becomes rapidly brown and thick; the presence of oily impurities in a solution is shown by the brown colour it acquires when shaken up with concentrated sulphuric acid. Chloral hydrate has the property of checking the decomposition of a great number of albuminous substances, such as milk and meat; and a mixture of it with glycerine, according to Personne, is suitable for the preservation of anatomical preparations. When heated with concentrated glycerine to a temperature of 110°–230° C., chloral hydrate yields chloroform, $CHCl_3$, and formate of allyl, $HCO(OC_3H_5)$; and by the action of nitric acid and strong sunlight, at 195° C. it is transformed into trichloracetic acid, $CCl_3.COOH$. The effect of chloral hydrate upon fresh blood, like that of formic acid, is to render it darker.

The breaking up of chloral hydrate, in the presence of alkalies, with the production of chloroform and formates, led Liebreich to the conjecture that a similar decomposition might be produced in the blood; and hence his introduction of the drug, in 1869, as an anæsthetic and hypnotic (*Compt. rend.*, 1869, lxix., 486). It has been supposed that its physiological action may be due to formic acid as well as to chloroform set free in the blood, the effects of the formic acid being attributed to the production from it of carbon dioxide. Personne, however, has administered sodium formate to dogs, without perceiving in them the slightest anæsthetic phenomena, or the abnormal formation of carbon dioxide (*Compt. rend.*, 1874, lxxviii. 129). He considers that chloroform is set free in the blood, but is not eliminated as such, being converted into sodium chloride and formate (*ibid.* 1869, lxix., 983); the prolonged action of chloral on the animal economy he explains on the supposition that, chloroform being produced at the expense of the alkali of the albumen of the blood, the latter, which may be regarded as an amide, forms with the trichlorinated aldehyde chloral a compound which, by the gradual action of the blood, affords a continuous supply of chloroform. Tanret, on the other hand, suggests that as chloral hydrate, when made alkaline with caustic potash, yields in the presence of the oxidizing agent potassium permanganate the formate, chloride, and carbonate of potassium, together with carbon monoxide, the alkalinity of the serum of the blood may determine a similar decomposition of chloral hydrate, the physiological effects of which may therefore be ascribed to poisoning or deoxidation of arterial blood by carbon monoxide (*Compt. rend.*, lxxix. 662; *Journ. Pharm. Chim.* (4), xx. 355–357).

The first effect of a dose of chloral hydrate is to produce a state of congestion of the brain, as evidenced by the condition of the retinal vessels; after 5 or 10 minutes, contraction of the vessels is observed, the retina becomes of a pale pink colour, and drowsiness ensues; when this wears off, the retinal and cerebral vessels resume their accustomed size (Dr W. A. Hammond). In cases of death from chloral, the cerebral vessels have been found much congested.

The effects of chloral hydrate vary with different individuals; but, as a rule, a dose of 20 grains acts in a healthy subject as a mild sedative of the sensory nervous system, and produces, about half or three quarters of an hour after it has been taken, a light, refreshing, and normal sleep, without causing headache or disturbance of the respiration and pulse.

Taken in large quantities chloral hydrate is a powerful soporific; it perceptibly lowers the temperature of the body, and diminishes the frequency and force of the heart's action, probably from paralysis of its intrinsic motor ganglia; whilst the rate of respiration is lessened, apparently through affection of the medulla oblongata. Excessive doses produce complete insensibility, and diminish, and at last abolish reflex excitability; pallor, coldness of the extremities, lividity, and muscular relaxation ensue; and death may result from cardiac syncope.

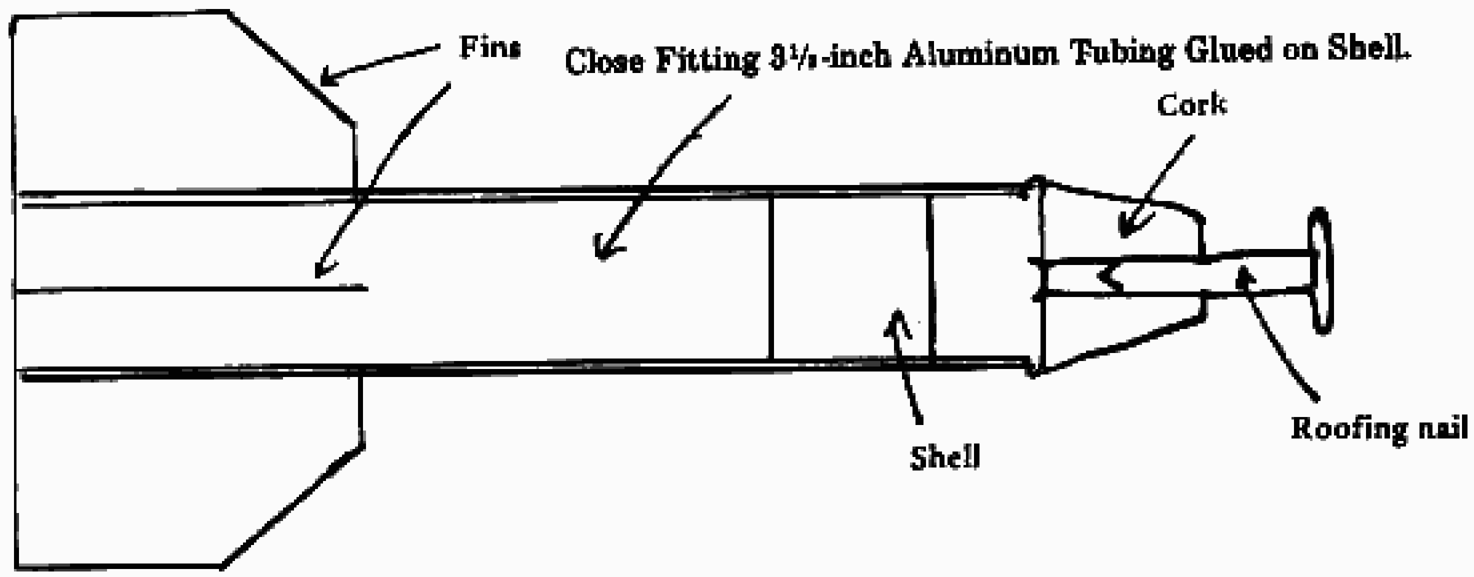
M Oré is the originator of a plan for performing operations during anæsthesia produced by the intra-venous injection of chloral hydrate. He shows (*Compt. rend.*, 1874, lxxviii. 515, 651) that it may be harmlessly injected, and that when thus brought into immediate contact with the blood, it effects complete anæsthesia of long duration, and is a rapid and effectual remedy for tetanus. Chloral hydrate sometimes fails to afford relief from suffering, and when it does not induce sleep, may occasion excitement and delirium. In some cases a dose has produced an eruption of urticaria. It must be administered with caution to children, and to patients having disease of the heart and of the digestive tract, certain affections of the bronchi, or hysteria. It appears that chloral cannot be decomposed and thrown off by a healthy body at a greater rate than from 5 to 7 grains an hour (Richardson, *Lancet*, 1871, 1, 209); and as the limit of the dose that can be safely taken is not affected by the customary use of the drug, as in the case of opium, but rather the reverse, its incautious employment in large quantities, and the practise of habitually resorting to it to gain relief from sleeplessness, from neuralgia, and from the effects of alcoholic excess, have in not a few instances led to fatal results. In consequence of this risk medical practitioners now use it less extensively. The continued use of chloral hydrate, too, is apt to cause a hyperæmic condition of the skin, diffuse inflammatory erythema of the face and chest, conjunctivitis, and interference with respiration; and may bring on deep melancholy, weakness of will, and inability to sleep without the drug.

Chloral hydrate is of special value as a soporific where opium is inadmissible, as in the case of children, in uræmia, and in some fevers. It is used in delirium tremens, rabies, severe chorea, acute mania, and phthisis, as well as in dyspnœa, pertussis, cholera, sea-sickness, cancer, chronic rheumatism, and gastralgia, and in parturition and eclampsia; and in cases of tetanus it is employed to produce muscular relaxation. Its antagonism to strychnia was first pointed out by Liebreich (*Compt. rend.*, 1870, lxx. 403). When administered to rabbits it has been found to be a remedy for poisonous doses of strychnia (Bennett, *Edin. Med. Journ.*, 1870, xvi. 262); but Oré has shown (*Gaz. Médic. de Paris*, 1872, p. 401) that the hypodermic injection of that drug is of no avail in the case of rabbits poisoned with fatal doses of chloral hydrate. Numerous experiments have led to the conclusions that "chloral hydrate is more likely to save life after a fatal dose of strychnia, than strychnia is to save life after a fatal dose of chloral hydrate;" that after a dose of strychnine has produced tetanic convulsions, these convulsions may be reduced in force and frequency, and life may be saved, by means of the influence of chloral hydrate; but that though the effects of a poisonous dose of the hydrate may be mitigated, the coma produced by its action on the brain is not removed by strychnia (Bennett, Report in *Brit. Med. Jour.*, 1875, 1, 97; Ogilvie Will, *Edin. Med. Jour.*, April 1875, 907). Chloral hydrate modifies the action of a fatal dose of extract of Calabar bean, but is of little service if given some time after the latter. The effects of chloralism are combated by provoking emesis, and by stimulating freely.

FIRE BOMBS

Most fire bombs are simply gasoline filled bottles with a fuel soaked rag in the mouth (the bottle's mouth, not yours). The original Molotov cocktail, and still about the best, was a mixture of one part gasoline and one part motor oil. The oil helps it to cling to what it splatters on.

Some use one part roofing tar and one part gasoline. Fire bombs have been found which were made by pouring melted wax into gasoline.



SHOTGUN SHELL BOMB

SHOTGUN SHELL BOMBS

These little goodies are affectionately known as "nut busters." They are simply shotgun shells enclosed in cardboard rolls with cardboard fins put on. On the primer end of the shell is glued a small cork with a hole drilled through it. A roofing nail fits in the hole snugly enough to stay in but loose enough to plunge into the primer upon impact.

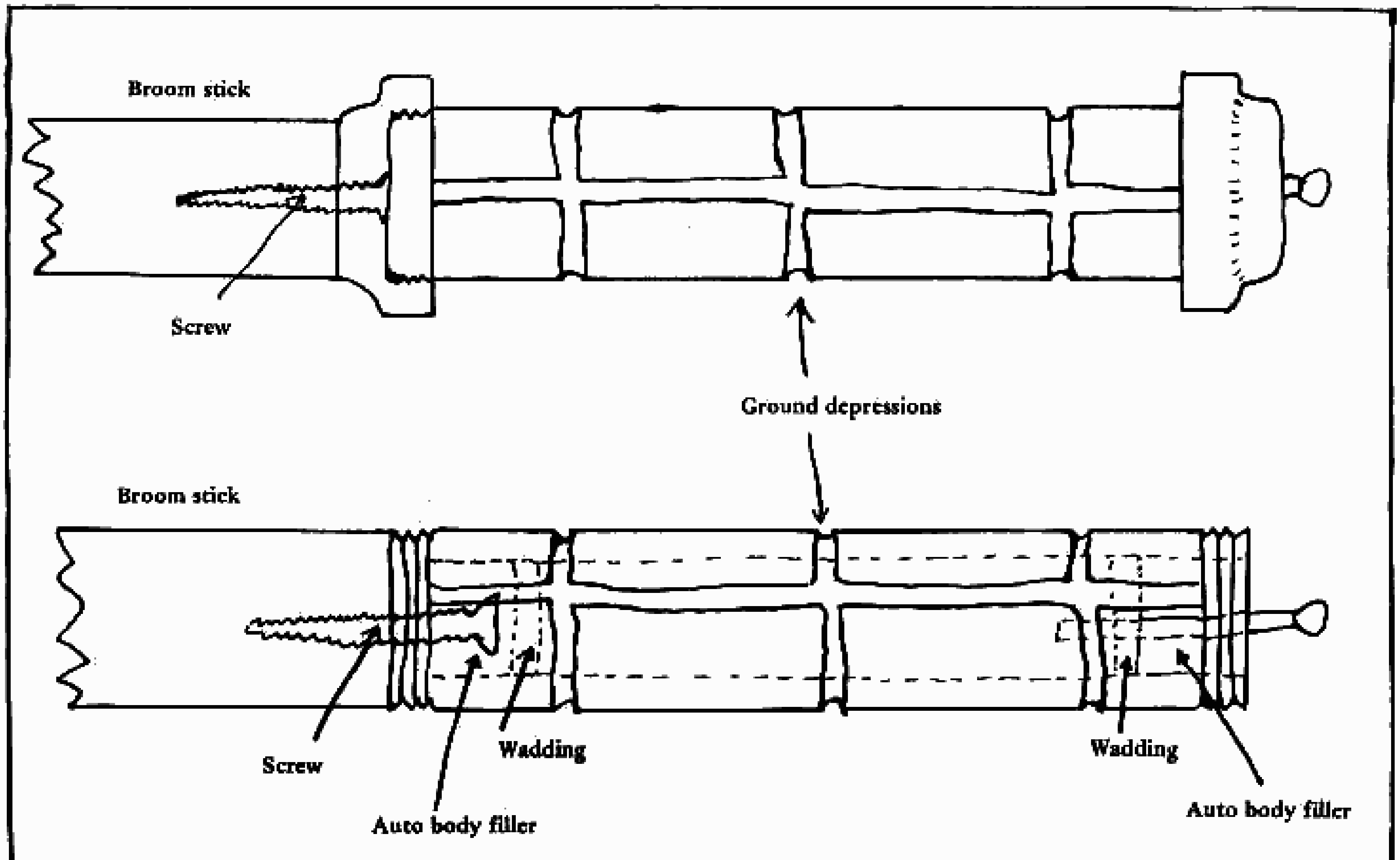
Since the shell is not confined in the chamber of a gun, it will naturally not cause the same amount of damage. But if it goes off between a fellow's legs he can look forward to becoming a soprano.

These bombs are thrown singly or by the handfull into the air over milling crowds. The weight of the shell and the stabilization by the fins causes the nut buster to head straight downward.

It has tremendous effect as its presence is usually a surprise. The threat of more coming in is guaranteed to rout any mob.

Not only does it go off on the pavement but it will also explode on contact with a person's head or shoulder. At night it is impossible to trace its point of origin.

A clever use for a plain shotgun shell is as a muffler bomb. The shell is simply shoved up a car's exhaust pipe with a length of stiff wire until it drops into the muffler. After a few minutes on the road the shell explodes, totalling out the muffler and treating the driver to a sick kind of panic.



POTATO MASHER GRENADES

POTATO MASHER GRENADES

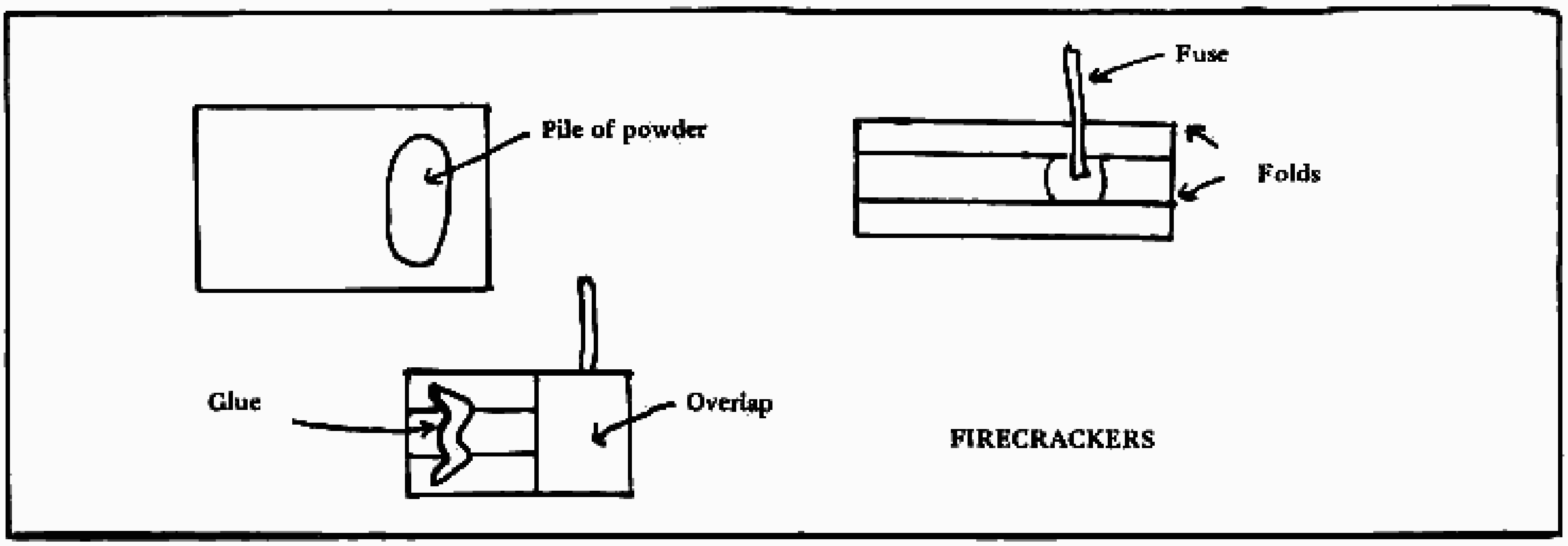
A grenade on the end of an eight-inch piece of broom stick can be thrown almost twice as far as when you hold the grenade directly in your hand.

As illustrated, both caps are drilled and the bottom cap is fitted with a screw that goes into the stick. The piece of broom stick is also drilled but a size smaller than the screw. This is to make the screw go in easier without splitting the stick.

The fuse is cut the length it takes about five seconds to burn. It is glued firmly into the cap and generously covered with flare igniter. To ignite, the fuse is scratched with a strip of wood covered with red phosphorus and sand.

Pipe grenades can be caused to fragment simply by grinding depressions in them with a grinding wheel. The depressions are made before the explosive is put in. Depressions 1/16 inch deep cut the resistance of the pipe enough to make it shatter.

If you have any skill at all you can grind such a grenade in about two minutes.



FIRECRACKERS

FIRECRACKERS

Firecrackers are so simple to make that many books on fireworks ignore them. There are two main types of firecrackers but many mixtures.

Handmade giant firecrackers are made by first rolling paper around a 3/4 inch dowel until the paper is 1/8 inch thick. This is the case.

The best paper to use is from paper sacks. It is cut to the desired width and the length that makes it 1/8 inch thick when rolled. On the last roll, the paper is glued and the tube is slipped off the dowel.

One-quarter inch thick slices of the dowel are used to plug the ends.

The plug for the fuse end is drilled to allow for the fuse. The plugs are smeared with glue before being pressed into the ends of the tube. More glue is squeezed in around the fuse after it is put in.

In all the directions I have for making giant firecrackers it is recommended that they be filled only one-third. It is agreed by all who wrote about them that completely full ones aren't as loud as those that are one-third full.

I admit to never having made one. I did play with them as a child and used them more for their destructive properties than for their noise. They do have terrific force, even when only one-third full.

Anyone wanting to make them can test for himself whether there is more concussive force in a full firecracker or one which is only one-third full.

If you choose the one-third full kind you should be sure to put the fuse well into the firecracker to make sure it reaches the powder.

For the small firecracker, two kinds of paper are used. Any regular paper is used for the tube but thin wrapping tissue is used for the inside.

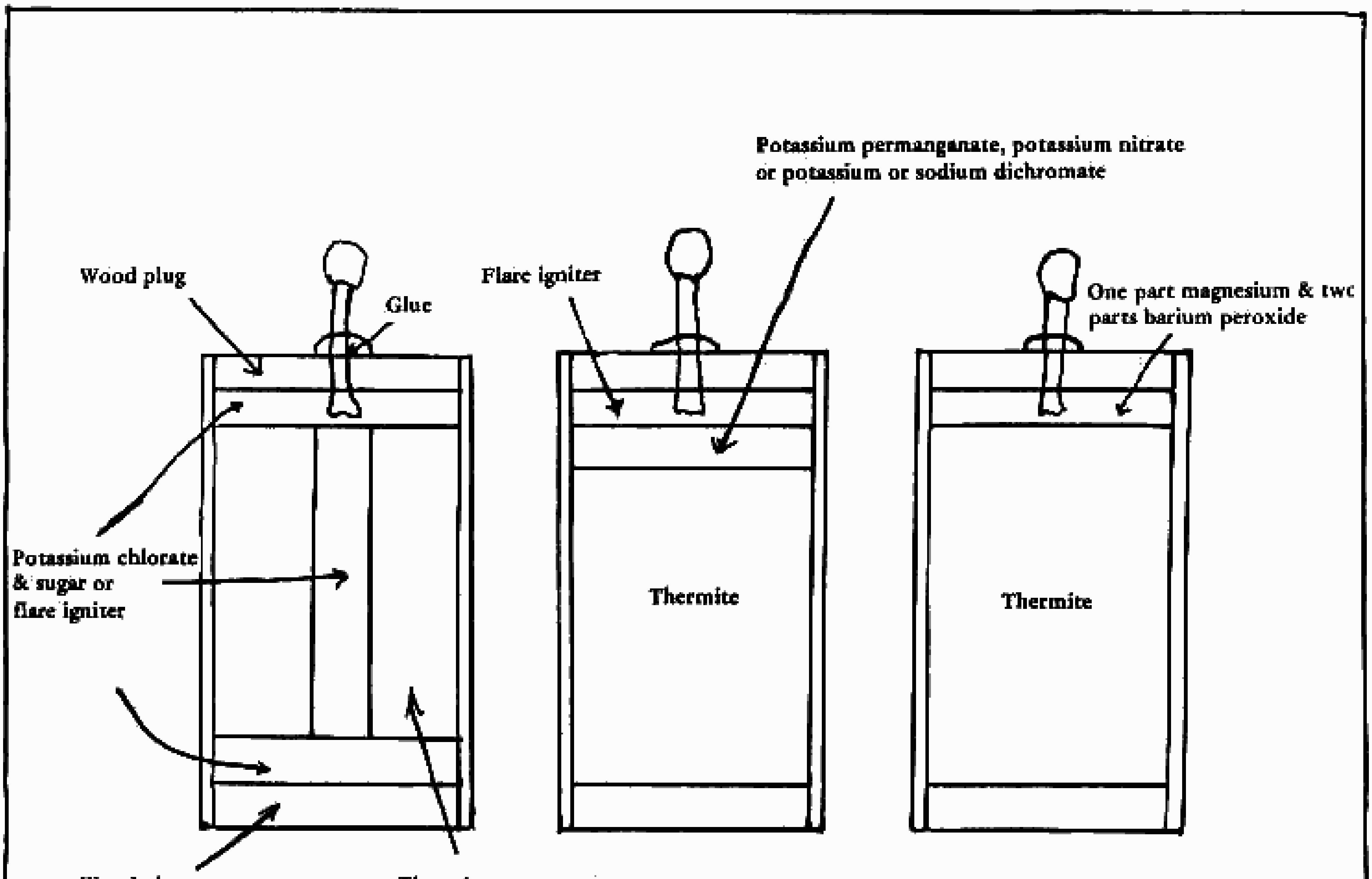
As illustrated, a pile of powder is put on the tissue. The edges are folded over and the fuse is placed so its end is in the powder area.

The short end of the tissue is then lapped over the powder and fuse. Next, the whole thing is rolled tightly to the end over the glue.

The outside is a strip of paper about 11 inches long and slightly wider than the length of the powder core. It is smeared lightly with glue and rolled tightly around the powder core.

If any glue is water based, the firecrackers are allowed to dry for a couple of days. Then airplane glue is squeezed into both ends.

Adequate firecrackers can be made with commercial gunpowders. Pistol powder is best but even shotgun powder will do.


Potassium permanganate, potassium nitrate
or potassium or sodium dichromate
Wood plug
Glue
Flare igniter
One part magnesium & twc
parts barium peroxide
Potassium chlorate
& sugar or
flare igniter
Thermite
Thermite
Wood plug
Thermite

THERMITE IGNITERS

Of the many powder formulas to choose from, I picked three as being the most practical and stable.

The first is four parts potassium nitrate, one part sulfur. The second is, six parts potassium nitrate, two parts aluminum powder and three parts sulfur. The third is five parts barium nitrate, two parts aluminum powder and one part sulfur.

The potassium nitrate and charcoal are both ground as finely as possible before being mixed. An electric blender can be used to pulverize both but should never be used for any other explosive stuff.

INCENDIARIES

For sheer terrorism, incendiaries can't be beat. They are horrifying to look at and if set off in a crowded room, instant panic is guaranteed. They burn at 4,000 degrees and give out a blinding light.

Wartime incendiaries had magnesium casings which burned fiercely. If water was put on them they disintegrated, sending burning metal in all directions. You probably can't get hold of magnesium tubing so you will have to settle for aluminum.

Aluminum tubing, bought at any hardware store, is the next best casing for improvised incendiaries. It doesn't burn as fiercely as magnesium but is still pretty awful.

The tubing should be at least 1½ inches in diameter. This is to make sure there is enough thermite to burn the tubing.

Aluminum tubing is cut into suitable

lengths and slices of a large dowel are cut for plugs. One slice is drilled to accommodate the fuse.

Thermite is a mixture of three parts, by volume, of red or black iron oxide and two parts of fine aluminum powder.

The tube is filled nearly full and tamped until the thermite is one inch from the top. A circle of tissue paper is then put in to keep the thermite from blending with the igniter.

The igniter is a mixture of one part, by weight, of powdered magnesium and two parts of barium peroxide. This is mixed carefully, preferably by rolling back and forth in a plastic container. It isn't all that sensitive but it doesn't hurt to be cautious. Goggles and gloves should always be worn when working with explosive or flammable substances.

When mixed, a one-half inch layer of thermite igniter is put into the tube. Another circle of tissue is added and one-fourth of an inch of flare igniter is spread in. The one-fourth inch of inside tubing is cleaned of flare igniter to accommodate the plug.

A bare fuse is stuck straight up in the center of the flare igniter and it is left to dry for a day or two. Then the drilled plug is smeared with glue and pushed over the fuse. Then flare igniter is daubed on the fuse and when dry, the thing is ready to use.

OTHER THERMITE IGNITERS

Thermite can also be ignited by potassium chlorate and sugar or flare igniter, although not as reliably as with the barium peroxide and magnesium.

To make a thermite grenade which will ignite by potassium chlorate and sugar or flare igniter, you start with aluminum tubing 1½ inches in diameter, or more, and five inches long.

Buy a length of dowel that fits snugly inside the tube. Cut one-fourth inch thick slices of the dowel to plug both ends. Bore fuse holes in the slices that are to be used for the tops of the grenades.

Put glue around the bottom slices and put them in the ends of the tubes. When the glue is dry, put in a one-fourth inch layer of three parts, by volume, of potassium chlorate and two parts of sugar, well mixed, or flare igniter. Then put in a circle of tissue over the mixture so it stays by itself.

Next, wrap a pencil once with a 4¼ inch piece of tissue and hold it in the center of the tube while you pour in the thermite. When the tube is full, tamp the thermite down, being careful not to damage the tissue around the pencil. Put in and tamp the thermite until it fills the tube to one-half inch from the top.

The pencil is then carefully removed from the tissue tube and potassium chlorate and sugar or flare igniter is funneled in until it meets the top of the thermite.

Then, put in another circle of tissue over the thermite and add a one-fourth inch layer of potassium chlorate and sugar or flare igniter. Next put in the plug and the fuse. Glue is squeezed in around the fuse to hold it in place.

OTHER IGNITERS

Potassium permanganate, potassium nitrate and potassium or sodium dichromate can all be used to ignite thermite. However, they won't ignite by fuse so must be helped along by an additional igniter.

First, either of these igniters must be crushed to the fineness of granulated sugar. A quarter-inch of the igniter is poured over the thermite and a quarter-inch of flare igniter is spread over it.

The fuse is stuck straight up in the flare igniter and the mess is allowed to dry for a couple of days. Then the plug is glued and put over the fuse and pressed firmly into the end of the tube. It is good to squeeze some more glue around the fuse as the flare igniter doesn't hold it very well.

DYNAMITE

Many Militants use dynamite. In some states it takes a fire marshal's permit to buy dynamite but such a permit is easy to get. All you have to do is file a mining claim in some desert wasteland. The land office, usually in the courthouse, is where to learn how to go about filing a claim. Then you take your claim to the fire marshal and if you are not an obvious freak he will give you a permit.

The mineral you claim to be hunting will depend on your own area. In the courthouse there is usually a geological survey office where they can give you a list of minerals mined in your area.

You should choose one that requires blasting.

One Militant was out in the boondocks and found several outcroppings of pretty rocks. He figured they would look great in aquariums. He filed his claim and got his permit.

After doing enough blasting to prove he was using his dynamite legitimately, he was supposed to share all the rest he bought with his friends. But he uses it all for blasting and is fast becoming the aquarium rock king of Southern California. Now he looks down on his former friends.

Not all Militants are like him. They file their Mickey Mouse claim and after a little blasting to make the area look like it is being worked they buy all the rest to sell to friends.

With your permit you can buy dynamite for $20.00 for 100 sticks and resell it for $2.00 per stick. Less the small cost for blasting caps and a little fuse given with each sale, you will make 1,000% profit. If you steal it your margin of profit will be even greater.

Dynamite is bought from stores selling to miners. Such stores can be located through the business section of the phone book under "Explosives."

Militants in the service, and especially the National Guard, steal great quantities of explosives as well as military equipment and supply their civilian friends. Dynamite is also stolen from construction sites, even in the middle of large cities.

Dynamite ranges in explosive velocity from 4,000 to 23,000 feet per second. The lower velocities are used for moving earth and such and the higher velocities are used for their shattering effect on stone and steel.

Lower velocity dynamites are made up from 20 to 60% nitroglycerine with sand, clay or sawdust as an absorbent.

The low velocity dynamites are very dangerous to store because the nitro settles to the bottom in a few months and the stuff has to be turned every couple of weeks, like hatching eggs. If not turned, the settled nitro can explode at the slightest jar.

If you are smart you will buy only the gelatin dynamites. They are made up of up to 90% nitro and the rest is nitrocotton. These are the most powerful. These are also safer to store, as they become less sensitive with age and don't have to be turned.

THE STILL

Once the Militant has his chemicals, he sets up his still. It is small, efficient and safe. In it he makes things like tear gas, prussic acid and occasionaly distills alcohol.

First, a flask is fitted with a one-hole rubber stopper. A short length of thin glass tubing is inserted into the hole. A five foot length of thin rubber tubing is fitted over the glass tube and coiled into the ice bucket and out through a hole near the bottom. The end of the tube is fitted over another glass tube which is in a two-hole stopper stuck into a bottle. The other hole contains another glass tube to which is attached another length of tubing long enough to reach outside to get rid of any noxious or poisonous fumes.

The equipment for the still is cheap and simple to get. Most of it can be bought from your local drug store. They carry tubing, stoppers, glassware and many chemicals which they freely sell to doctors, students, etc. If you get on good terms with your druggist and he doesn't know you're a freak you can buy most of your stuff from him.

A ring stand or tripod for the flask is more handy than the can in the illustration. But a tin can with strips cut out of it for ventilation and for the removal of the lamp is usually adequate.

The checklist of equipment is:

1. alcohol lamp. 2. ring stand, tripod or tin can. 3. 500 ml or larger flask. 4. assortment of one and two-hole and holeless rubber stoppers of various sizes. 5. about six yards of 3/16 of an inch (inside diameter) rubber tubing. 6. about a foot of six millimeter (outside diameter) laboratory glass tubing. 7. child's plastic bucket. 8. receiving bottle.

The hole in the bucket for the tube is made somewhat smaller than the tube so it will fit snugly and prevent leakage.

Full strength wood alcohol for the lamp can be bought at the drug store. Rubbing alcohol, although 30% water will burn in the lamp but not so well. You can distill the pure alcohol off the water from rubbing alcohol.

This is best done over a gas or electric stove. First a large pan with a couple of inches of water in it is put on the burner to be used and the others are turned off.

The still is set up as in the illustration except the receiving bottle is larger and doesn't need a stopper or tube going outside. The flask is filled with rubbing alcohol to just under the neck and set in the pan of boiling water.

In this setup a coathanger wire with a loop in its middle is put over the neck of the flask and fixed to the sides of the pan. This is necessary because as the alcohol distills off, the flask gets lighter and would rise in the water and fall over without support.

Another consideration is to make sure the tube does not flop over and collapse. This can be prevented by hanging a string from the ceiling by which the tubing is held above the flask.

The tubing should be further supported so it does not touch the hot edge of the pan. If it is allowed to lie over the edge it will melt.

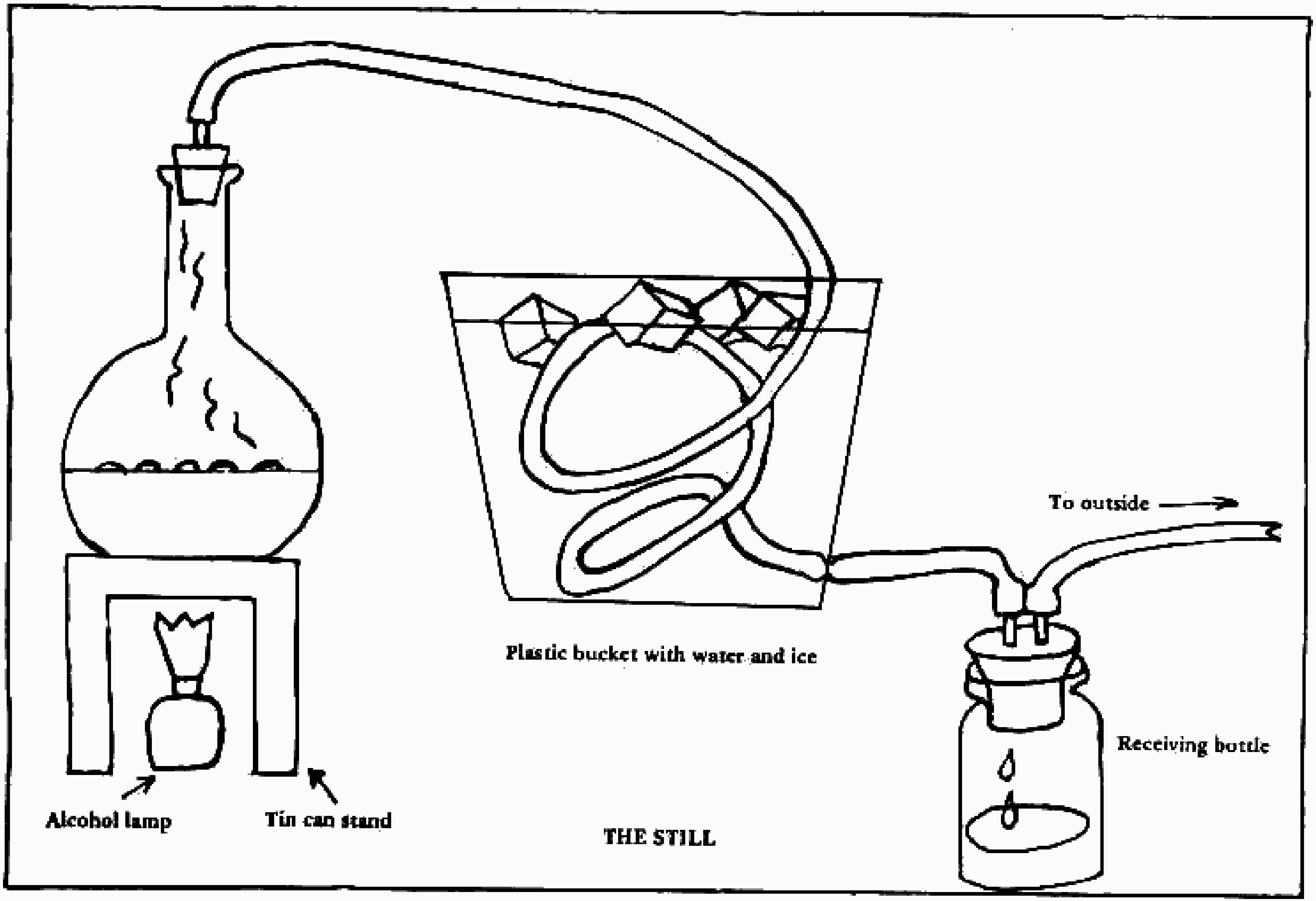
When the action starts the alcohol will fairly flow into the collecting bottle. When it stops all that is left in the flask will be water. If left alone, water would start dripping, much slower than the alcohol, but this is not wanted.

This is the only case where you should distill over a stove. A stove is harder to control than an alcohol lamp. It is also harder to clean up than a table in case of an accident.

TEAR GAS

There are several eye and nose irritants on the market which can be easily duplicated by Militants. One is "Defend." It is advertized as leaving a red stain so an attacker can be identified. The stain is not visible and the active ingredient is common household ammonia. Forget it. Besides, ammonia turns to water in a few seconds and is more likely to enrage than to repel an attacker.

A much better irritant is formaldehyde. Better known as embalming fluid, it smells horrible, hurts the eyes and nose, and on exposure to the air it vaporizes, making a room



THE STILL

uninhabitable for hours.

It can be squirted from a water pistol or nasal inhaler, poured on the floor or vaporized by a bomb described under stinkum.

This was accidentally tested after a visit to the Avilas of Eureka, California. I threw my jacket on an easy chair and my anahist nasal sprayer fell out. It was filled with formaldehyde which I carry for vicious dogs and members of the Eureka City Council.

Mrs. Avila found it later and put it on the kitchen table. Her sixteen year old daughter, Laura, saw it and, feeling an attack of the sniffles, did then take it and squirt it up her left nostril.

The action got pretty heavy about then as she went into convulsions and almost blacked out. She wiped her hand across her nose and got some formaldehyde under her upper lip. This was so painful she thought she would lose her mouth.

A scratch on the back of her hand got some formaldehyde and the agony was almost as bad as everything else. Even though none had gotten directly into her eyes, they began to tear copiously and she could hardly see.

She was totally incapacitated for at least twenty-five minutes. She couldn't do a thing except yell. She regained her sense of smell several hours later and luckily there was no lasting damage.

Formaldehyde can be bought at the drug store under the pretext of wanting it to preserve mice or other lab specimens.

The irritant mailmen use against dogs and which is sold widely for self defense is oleoresin capsicum. Capsicum is the hot essence of red peppers. Oleoresin is the process for extracting it:

To extract the capsicum, grind up four ounces of red pepper seeds in a blender or with a mortar and pestle. Red pepper seeds are bought in the grocer's.

The dry, ground seeds are then put into a coffee percolator in which there is about 16 ounces of alcohol, preferably with the water distilled out. The seeds are then percolated for about a half hour.

The alcohol is then distilled off until there are only a couple of tablespoons of red liquid left in the flask. The red liquid is then added to a half pint of light mineral oil, bought at a drug store.

It can be sprayed from a nasal spray. Another good way is with a window cleaning sprayer bought at any dime store. The tube of the sprayer is cut to fit in a two ounce medicine bottle. This way you have enough goody to last through a whole demonstration, no matter which side you're on. It is also nice to keep by the door to repel intruders.

Before using, the container should be given a few shakes. Under laboratory conditions all the oil is extracted from the seeds. But with my Mickey Mouse method a lot of oil is left in so the residue is quite potent. Just be sure you strain out any larger bits so the sprayer hole is not clogged.

The ground seeds left in the percolator are dried and saved. They are great for throwing into the faces of people in a mob. If you really want a laugh, throw some broadcast from a theater balcony during the death scene in "Love Story."

The goody called MACE is probably only acrolein. If not, it works just as well as MACE and is simple and fun to produce.

Acrolein is not toxic but causes horrible pain in the nose and copious tears, and irritates the skin. A shot in the face from a water pistol or some other sprayer will put anyone out of the game for at least a half hour.

Acrolein is best made an ounce at a time. Put in the flask 2½ ounces of glycerine and 3/4 ounce of sodium bisulfate (Sani-Flush), both of which can be bought at any grocery store.

The still is set up like in the illustration with the outside tube connected as the fumes are bad.

When the mixture starts to bubble it must be watched constantly to make sure it does not bubble up into the neck of the flask. If it starts for the neck of the flask, remove the lamp until it settles down. If the lamp is too hot, the tin can is raised on small blocks until the right heat is gotten.

Distill off an ounce of acrolein and take away the lamp. An ounce is all this size batch is good for. Let the flask cool for an hour before opening and cleaning. Pour the residue down the sink and put your face over the drain to get a sample of the vapor. Jesus!

Then cap the receiving bottle and wash everything the acrolein was in contact with.

The best squirter for the three irritants above is a water pistol. Most water pistols leak badly so they must be transported barrel up so the goody won't ooze out around the trigger. It will leak when you use it so it is best to put it in a plastic sandwich bag with the opening held around the barrel with a rubberband. If the pistol has a trigger guard it should be cut off and then it can be used just as easily in a plastic bag as otherwise.

For casual carrying around, you can't beat a nasal spray. The best ones can be screwed open so the goody can be poured in. If not, you have to squeeze it and put its nozzle into the goody. When the pressure is released the irritant will be sucked up.

Such irritants are illegal to carry in some states. That's one of the reasons the nasal spray is best. If you are searched and it is found, there is little chance it will be recognized for what it is.

I don't know what advice to give you if the cop has the sniffles and goes to use some of your goody.

STINKUM

Iron sulfide is sold for $.35 for only 1/8th of an ounce. Easier to make, just as potent and costing about $.50 a quart is ammonium sulfide. It stinks to high heaven like rotten eggs and no one can stand to stay around it once it has been spilled on the floor or vaporized by an explosion.

To make some, you mix four ounces of sulfur with eight ounces of hydrated lime in a stew pot. A quart of water is added and the mess is heated and stirred until the sulfur has completely blended. The hydrated lime will sink to the bottom of the pan and the yellow liquid is then poured off into a bucket.

Take the bucket outside, if you have any sense, and add one pound of sulfate of ammonia. Stir it a minute and hold your nose. Then cover the bucket with plastic wrap and let it set for about a half hour. Then pour off the liquid slowly through a cloth filter into a bottle.

If you don't have an outside you can use your bathroom. Just hope no one has to go for an hour or so. The liquid is vile but it is not poison.

Incidentally, when I researched this formula I went to the garden store and bought a five pound bag of sulfate of ammonia for $1.65. Garden sulfur is very high grade and makes excellent gunpowder. It has 10% inert ingredients so 10% more should be added to any formula requiring sulfur. I bought the hydrated lime from a building supply store for $.10 a pound.

A word is in order about the spelling used for sulfur products. Different spellings are: sulfur, sulphur, sulfate, sulphate, sulfide, sulphide, etc.

Stinkum is either poured on the floor, shot from a water pistol, thrown in a bottle or light bulb or vaporized by a firecracker. The same goes for the formaldehyde or acrolein.

THE HYDROCHLORIC ACID GOODY

The hydrocloric acid goody is the most fun in the whole book. It takes many forms and works on the principle that hydrochloric acid reacts with aluminum powder, foil or metal, releasing a great, dark cloud of noxious gas which looks horrible and smells worse.

Hydrochloric acid is used for killing algae in swimming pools and for cleaning tile and stone work.

Where swimming pools are common it can be bought at the supermarket for less than a dollar a gallon. It is also sold at hardware stores.

Being only 37% strength, it is seldom harmful to the skin but will eat through clothing like battery acid.

Hydrochloric acid is also known as muriatic acid.

On damp nights, a bottle of the acid alone, broken in the midst of a crowd, will form noxious clouds of chlorine gas. Scream "Poison gas!" and you will have a panic that will give you laughs for years.

When you get some, open it up and give it a sniff. It won't hurt you because you couldn't stand to smell enough to be harmed. Then put a couple of square inches of aluminum foil in a can in your sink and pour some acid on the foil. If the acid bottle has been tightly capped the reaction of breaking down the aluminum and producing a dark noxious gas should start in about a minute. If the bottle has been setting for months, poorly capped, the reaction may be immediate. You can stop the action at any time by turning on the faucet and flooding the aluminum with water.

When you have tested the reaction with foil, try it with powder and then with aluminum metal cut from a pipe or a slab.

The versatility of the hydrochloric acid goody is amazing and should keep you fascinated for hours.

Of course, the Militant's most common use of the hydrochloric acid goody is to clear areas of people he doesn't like. In a movie or a meeting hall a tin can half full of aluminum powder, foil or chunks is put under a seat. The acid is in a bottle with its mouth covered with a couple of plastic bags held in place with a rubber band. You can also use a plain rubber or a balloon over the mouth of the bottle.

The cover is pierced with a pencil and the bottle is upended into the can, after which, the Militant gets up and walks out. If the acid is old and reacts immediately, a wad of sponge is put over the aluminum, causing the needed delay.

A person sitting beside the Militant would not notice anything, especially if something exciting was happening up front. By the time he noticed the odor the reaction would have left him with nothing to do but run squealing and pissing from the scene.

The outside goody is great, too. It is used to break up parades and demonstrations and in riots, where it's every man for himself and the devil take the hindmost.

It is simply a pint or quart bottle (a quart is better) filled with goody and wrapped with several layers of aluminum foil and put in a paper sack.

Now, say a group of Militants infiltrate a civilian parade at different points. At an agreed upon time they yell, "They're throwing things!" Then, while the other paraders are looking around and up, the Militants crash their outside goodies, still in the sacks, to the pavement.

As the parade moves on, the Militants filter back to where the goodies are. When the reaction starts they scream, "Poison gas! Poison gas!" and panic the whole mob out of the action.

The aluminum wrapped bottles have to be slammed down hard or they might not break.

IGNITERS

Igniters range from powder fuses that smoke and burn and ignite the device in a few seconds, to chemical igniters that take minutes, to watch timers that ignite the device electrically hours later.

The simplest fuse is made from gunpowder mixture, using the dextrine or glue but omitting the graphite. A length of cotton twine is stirred in the mush, which is wetter than that to be used for gunpowder, and when well coated it is hung up to dry.

If a thicker fuse is wanted, the coated string is folded along its length once or twice, depending on how thick you want it. Then a heavy object is attached to one end and spun, twisting the strands. The other end of the fuse and the heavy object are secured so the strands will remain twisted until dry.

The dried fuse, whether one or more strands, is stiff and brittle. With any bending the powder drops off in spots, making it burn unevenly. If your fuse is going to be handled or will be out in damp weather, you should make some Micky Mouse safety fuse.

Up to three feet of masking tape is unrolled and placed sticky side up on a table. Three-quarter inch wide tape is used for one-strand fuse and one-and-one-quarter inch wide tape is used for the four-strand fuse.

The dry fuse is simply laid along the tape's edge and the tape is rolled over it until it is nice and tight. It is then cut into the desired lengths.

A more sophisticated safety fuse is made by coating the fuse with spray-on plastic from an aerosol can. When this dries the fuse is coated with rubber mold compound, bought at any hobby store. The plastic is used first because the mold compound has a water base and would wet the fuse. The rubber would dry but the fuse would stay damp indefinitely.

Fuses of all kinds are best lit with the material used to ignite highway flares. This is because matches often go out or the Militant's hands are shaking so badly he drops the match into his fly.

Commercial safety fuse is almost impossible to light with a match. Coating its end with flare igniter makes it easy to light and also keeps loose powder from dropping out the ends. This also applies to homemade or other fuses.

Flare igniter is gotten from highway flares you can buy from any auto supply or surplus store for as little as $.15 each. The black igniting core is dug out, crumbled and dissolved with carbon tetrachloride, bought at any auto supply store.

Carbon tetrachloride is commonly used for dissolving grease from auto parts. Just enough is used to dissolve the igniter and it is then evaporated off in a well ventilated area as the fumes are harmful.

The gray powder is then mixed with just enough water to make a thick paste. The fuse ends are then dipped into the paste and dried.

The most difficult to light fuses are easily lit by a match or even with a drop of sulfuric acid.

If you don't want to waste a lot of fun flares you can make your own ignition mixture, which is the same stuff as found in flares.

A lifetime supply of the black part is made with 1½ ounces of black antimony sulfide, 2½ ounces of potassium chlorate and one ounce of dextrine or 1½ ounces of Lepage's Mucilage.

The black antimony sulfide and the potassium chlorate are both wet before being mixed. If they are mixed dry an explosion can result. Then add dextrine or glue and enough water to make a thick paste.

You don't need much of the red striker mixture. One striker can be used to light many fuses.

The red striker mixture is made with 1¼ ounces of red phosphorus, ½ ounce of dextrine or 3/4 ounce of Lepage's Mucilage (from the dime store) and 3/4 ounce of fine sand. Enough water is added to make a paste, slightly thinner than the black paste.

The striker is a tongue depressor, bought at the drug store, or any similar light, thin piece of wood. A couple of inches of the striker is smeared with the red paste and allowed to dry. The red paste should be stirred well before using as the sand will sink to the bottom after a time.

CHEMICAL DELAY IGNITERS

Chemical delay igniters have always been popular with the more versatile Militants. The most common such igniter, but a perverse one, is the sulfuric acid-potassium chlorate and sugar goody.

The igniter is a mixture of half potassium chlorate and half granulated sugar. It bursts into flame with the application of a drop of sulfuric acid.

The idea is to put some of the mixture into a glass or plastic tube and then stuff in some cotton, or paper. Some acid is then put into the tube with a medicine dropper, bought at a drug or hobby store.

The acid is supposed to seep slowly through the barrier and finally ignite the mixture. The bad thing about this system is that it often doesn't work or it works too fast.

When sulfuric acid eats through vegetable matter there is a reaction of great heat. This is often enough to break the glass tubing or melt a plastic drinking straw and can stop the action right there.

If the glass tubing holds, the acid still loses its potency as it reacts with the vegetable matter and that which reaches the mixture may be too weak.

The worst thing that can happen, however, is that it will work too fast. The acid can eat through the barrier in seconds instead of the minutes you think you have.

This could be disastrous if you loitered in the area for a minute to avoid looking suspicious. If you armed the device before going into the target area, you might not even get there.

To avoid such hangups you should use a non-reactive barrier such as asbestos fibers, bought from any building supply store. The acid will seep through the asbestos without making heat and without losing its potency. And since it doesn't eat the asbestos, it can be timed with much more certainty, which makes it safer and more sure.

Powdered highway flare igniter can be substituted for the potassium chlorate-sugar mixture. It is over half potassium chlorate and is simpler. In fact, if the plastic straw is pushed over a fuse coated with flare igniter, the fuse needs no other igniter.

Another chemical ignition device uses glycerine to react with potassium permanganate. Potassium permanganate is a relatively stable oxygenator and can easily be bought at the drug store. It is also used for staining microscope specimens, disinfecting fish tanks and curing fish fungus and fin rot.

The potassium permanganate is ground to a powder and mixed with the same amount of fuse powder or the highway flare igniter. Cotten can be used as a barrier as it doesn't react with glycerine.

At least an inch of glycerine is put into the tube, especially if you use a barrier. When it reaches the mixture it takes from three to five minutes for the ignition to take place.

For some reason, I haven't been able to get this to work except in a plastic straw. But that way it works every time and is lots of fun.

If the igniter is potassium chlorate and sugar or flare igniter or potassium permanganate, it needs a barrier to keep it in place. To make sure the fire train burns past the barrier to the fuse, the barrier should be flammable. To make material for this barrier, mix cotton with wet fuse powder or flare igniter. Then dry it and pull off pinches as needed.

To arm these devices a medicine dropper filled with acid or glycerine can be carried upended in a test tube in the shirt pocket. A plastic felt-tip marker with a clip to hold it upright in the pocket can be used instead of the test tube. It is simply hollowed out and the dropper fits in nicely.

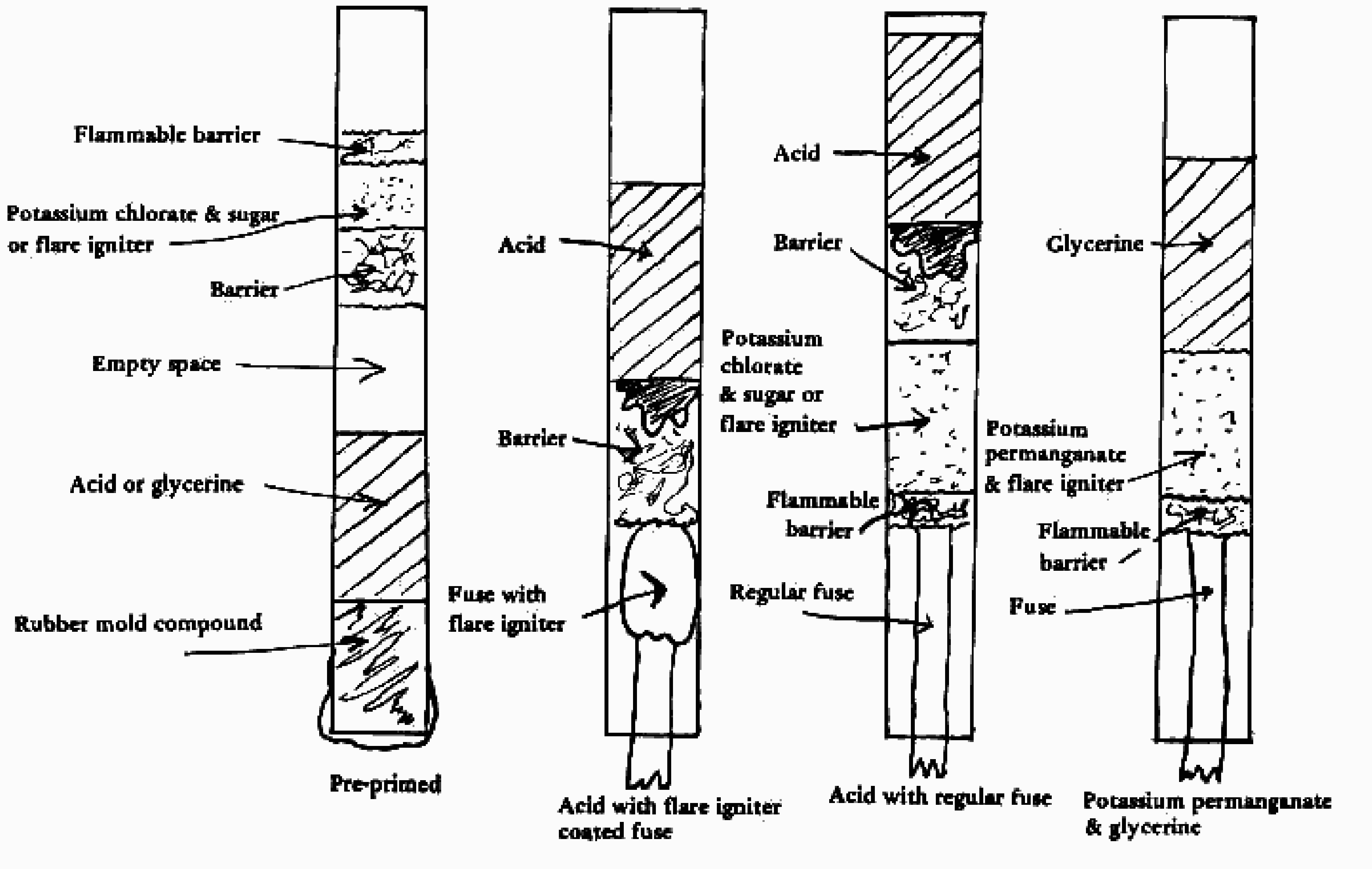
To avoid burned fingers, a string is tied to the dropper so it can be pulled out of the container.

To avoid the medicine dropper entirely, you can make up some pre-primed plastic straws. For these, you will need some rubber mold compound. Suck up a half inch of the compound into a 4½ inch plastic straw. Then let it dry for a couple of days.

Shortly before use, put in the acid or glycerine. Then, with a cotton tipped stick, clean out the straw above the acid or glycerine so there will be none on the sides to ignite the mixture.

Next, put in the barrier and push it within an inch above the acid or glycerine. Then put in the mixture and the flammable barrier.

You can carry this quite safely upended in


Flammable barrier
Potassium chlorate & sugar or flare igniter
Barrier
Empty space
Acid or glycerine
Rubber mold compound
Pre-primed
Acid
Barrier
Fuse with flare igniter
Acid with flare igniter coated fuse
Acid
Barrier
Potassium chlorate & sugar or flare igniter
Flammable barrier
Regular fuse
Acid with regular fuse
Glycerine
Potassium permanganate & flare igniter
Flammable barrier
Fuse
Potassium permanganate & glycerine

CHEMICAL DELAY IGNITERS

your shirt pocket. When ready for use it is turned over and its open end is pushed over the fuse.

BOMBS

Although the wristwatch time bomb is not a formula, I feel that no book concerning bombs and Militants should be without this.

The diagram is strung out to show the points of contact. The igniter is a flashlight bulb, carefully broken to keep the filament intact.

Filaments from household light bulbs can also be used but they are very delicate. The bulb is broken and the filament is removed and carefully attached to the two copper wires.

Improvised goodies are fun and give a sense of creative accomplishment. Even so, an electric dynamite cap will take the place of a lot of ingenuity.

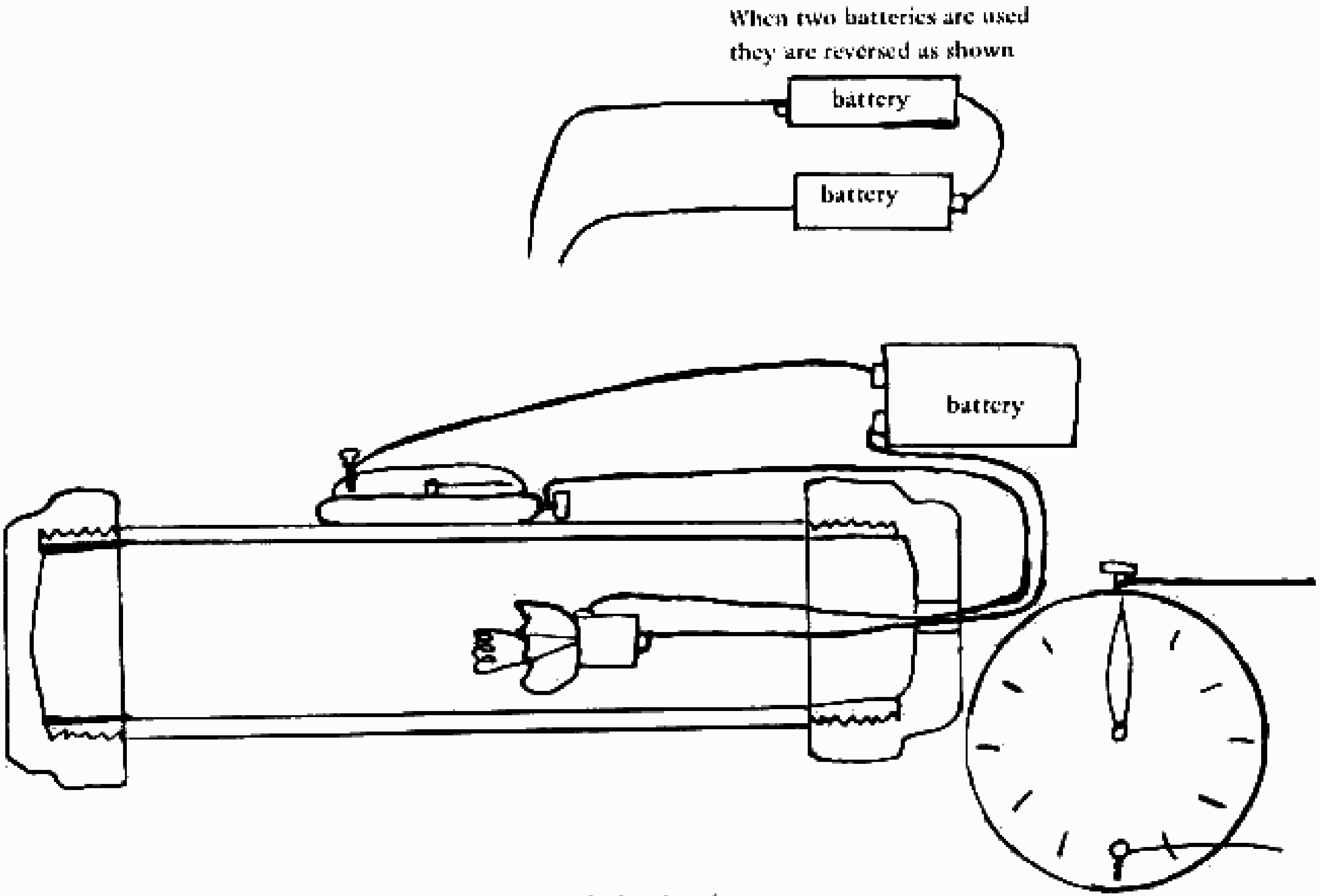
Flashlight and transistor radio batteries are sufficient to heat the filaments or detonate the dynamite cap. If flashlight or pen light batteries are used they should be reversed as in the illustration.

The wires should be soldered to the battery terminals to insure contact. The best wire is the thin, plastic covered kind used in transistor radios.

A hole is drilled into the plastic watch lens and a small nail is inserted and glued in place so its point doesn't touch the watch face.

If the bomb is to go off more than an hour after it is set, the minute hand is taken off.

The watch hand making contact with the nail is sanded to remove any paint on the contact edge.



Wristwatch time bomb

When the bomb is finished the parts are compacted and taped securely to its casing. The watch is secured with transparent Scotch Tape so that the hands are visible for setting.

The watch is allowed to run down before attaching it to the bomb and is wound only after it is set.

To avoid frustration from a dud bomb, the timer, battery and filaments should be tested before arming an actual bomb. This is done by putting the filament into a small pile of powder. If it ignites, disconnect the battery immediately to save the filament. Examine the filament carefully to make sure it is still intact and if it is it can be reused.

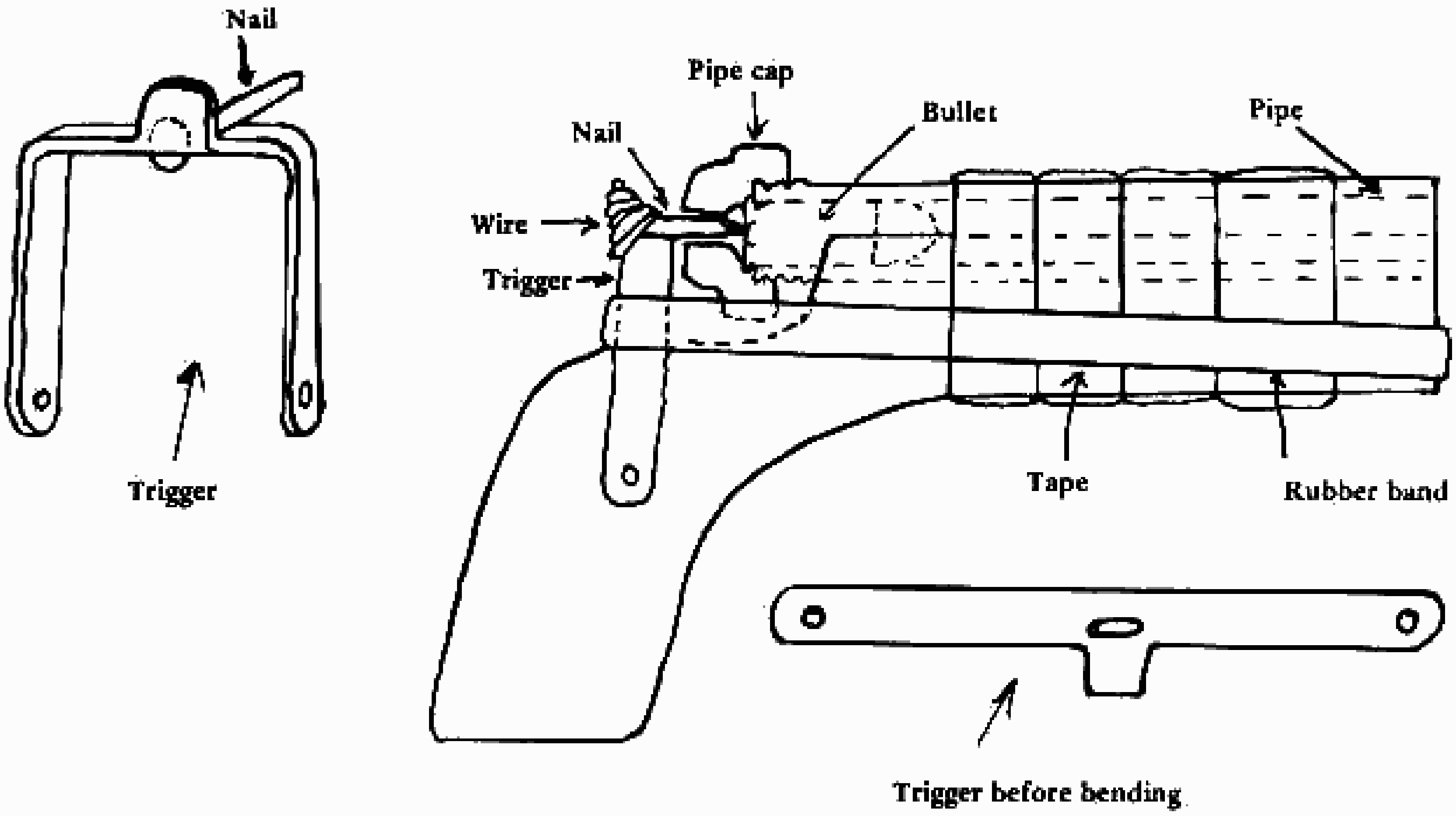
PIPE BOMBS

Pipe bombs, whether filled with match heads, gunpowder or high explosives, should be lined with plastic Baggies or freezer bags. This prevents friction, static electricity and any chemical reaction between the explosive and the metal.

The mouth of the bag is folded back over the threads and the explosive is put in. Next, the fuse is put in and the plastic bag is wrapped tightly around the fuse and held with a rubber band. All this is necessary because any explosive on the pipe threads could cause the bomb to explode when the cap is screwed on.

The cap for the fuse hole is drilled from both sides with any high-speed steel industrial twist drill bit. The bit is used with any electric hand or table drill.

The size of the hole should be exactly the size of the fuse. The plastic bag should cover



ZIP GUN

only the lower part of the fuse. Flare igniter, if used, should be put on the fuse after the cap is screwed on as the hole would have to be made larger than necessary to accommodate the glob of flare igniter.

PIPE OR "ZIP" GUNS

Commonly known as "zip" guns, guns made from pipe have been made and used for years by juvenile punks. Today's Militants make them just for the hell of it or to shoot once in an assassination or riot and throw away if there is any danger of apprehension.

They can be used many times but with some, a length of dowel is needed to force out the spent shell.

There are many variations but the illustration shows the basic design.

First, a wooden stock is made and a groove is cut for the barrel to rest in. The barrel is then taped securely to the stock with a good, strong tape.

The trigger is made from galvanized tin. A slot is punched in the trigger flap to hold a roofing nail, which is wired or soldered onto the flap. The trigger is bent and nailed to the stock on both sides.

The pipe is a short length of one-quarter inch steel gas or water pipe with a bore that fits a cartridge, yet keeps the cartridge rim from passing through the pipe.

The cartridge is put in the pipe and the cap, with a hole bored through it, is screwed on. Then the trigger is slowly released to let the nail pass through the hole and rest on the primer.

To fire, the trigger is pulled back with the left hand and held back with the thumb of the right hand. The gun is then aimed and the thumb releases the trigger and the thing actually fires.

Pipes of different lengths and diameters are found in any hardware store. All caliber bullets, from the .22 to the .45 are used in such guns.

Some zip guns are made from two or three pipes nested within each other. For instance, a .22 shell will fit snugly into a length of a car's copper gas line. Unfortunately, the copper is too weak to withstand the pressure of the firing. So the length of gas line is spread with glue and pushed into a wider length of pipe. This is spread with glue and pushed into a length of steel pipe with threads and a cap.

Using this method, you can accommodate any cartridge, even a rifle shell. The first size of pipe for a rifle shell accommodates the bullet. The second accommodates its wider powder chamber.

A 12-gauge shotgun can be made from a 3/4 inch steel pipe. If you want to comply with the gun laws, the barrel should be at least eighteen inches long.

Its firing mechanism is the same as that for the pistol. It naturally has a longer stock and its handle is lengthened into a rifle butt. Also, a small nail is driven half way into each side of the stock about four inches in front of the trigger. The rubber band is put over one nail and brought around the trigger and snagged over the other nail.

In case you actually make a zip gun, you should test it before firing it by hand. This is done by first tying the gun to a tree or post, pointed to where it will do no damage. Then a string is tied to the trigger and you go off several yards. The string is then pulled back and let go. If the barrel does not blow up, the gun is safe to fire by hand.

You should not attempt to register such a gun.

HOW TO BEAT A METAL DETECTOR

Many Militants squirrel away stockpiles of guns and bombs and as fast as the authorities find them with metal detectors, the Militants discover new ways of fooling the metal detectors. Militants hiding lethal goodies have discovered the following tricks to fool the detectors.

Rural Militants bury illegal items under metal scrap piles or where garbage with tin cans has been thrown for years. There is so much rust and bits of metal in the soil that the detector indicates that a tank is buried there.

Not believing there is a tank buried there (although there might be) the searcher moves on to find a more localized, and therefore easier, digging job.

Iron filings and lathe cuttings scattered over the site will give the same false readings. The agent using the detector will figure he is over a dump site or an iron mine. Unless he can con some archaeologists to dig up a few hundred cubic yards of dirt he is apt to just wander off and get blind drunk.

The floors of barns, being impregnated with iron-containing urine and excrement from the animals, render metal detectors useless.

Fence corners and other places where animals gather regularly are good places to bury contraband since the soil there is the same as that in barns.

Since streams deposit metallic oxides along their courses, a dry stream bed will likewise register a bonanza which no civil service worker will tackle.

City Militants have more space problems than do rural ones. But they still find ways of hiding stuff from detectors. The concrete floor of a basement is a great place under which to hide metallic objects. If there is a way of digging underneath the cement, the objects are safe from the detector. It will buzz everywhere and not pinpoint anything.

Those lucky enough to have a basement space to build a secret room are least likely to be found out. Walling off a corner of the basement makes a dandy goody hider and can also hold a body or two.

If the basement walls are made of reinforced concrete, that is, has those steel rods embedded in them, the new wall must give the same metallic reading. To achieve this, the mortar cementing the bricks is liberally sprinkled with cut soft wire in about one-eighth inch bits or a few handfulls of tiny wire nails. None is put into the mortar used to cover the brick wall. In this way, the brick and the concrete will measure the same metallically.

Whether the secret compartment is walled with metalized mortar or is just a plain brick wall, the goodies to be hidden are placed in the middle of the space and not touching any wall.

The poor Militant who has only a little back yard and no cows, garbage or scrap pile has a real digging job ahead of him. He needs a hole five or six feet deep.

The goodies are stored in a wooden box covered with tar or creosote to protect it from the moisture. Then the box is covered around and on top with about a foot's thickness of loose, non-metallic rocks. Next, the hole is filled with dirt.

Smart Militants put a layer of plastic over the rock covered box, since a metal detector works best if damp earth is in contact with the hunted objects.

BLOWING UP A CAR

Those Militants not content to psych out the driver with some practical joke have his last ride in mind.

The best methods require getting under the hood. Explosives are placed as near the occupants as possible. The fuse, homemade, commercial or safety, is wrapped a few turns around the exhaust manifold. After a few minutes on the road the exhaust manifold gets almost red hot and ignites the fuse.

This way is more certain than wiring the car because since it blows up on the road the wreck will do the victim in even if the blast doesn't. Besides, if the intended victim is a passenger instead of the driver, the driver may start the engine before the passenger gets into the car. You can see how embarrassing that would be to the bomber, can't you?

Old-fashioned types, like the Mafia, love to wire cars. They are too set in their ways to change and besides, they get a charge out of seeing a car blow up before their eyes instead of imagining it going to hell on the road.

They usually use about three sticks of dynamite, two lengths of electric wire with two alligator clips for quick attachment, and an electric blasting cap. The cap is stuck into a dynamite stick and its two wires are connected to the two electric wires. Then one alligator clip is clamped to the input side of the coil and the other is fastened to any metal surface in the car's frame as a ground.

This is very simple and you'd think anyone could do it. But sure enough, there are always morons who will attach one clamp to a spark plug and one to a ground. This usually results in misfires and no end of frustrations.

EVADING PURSUIT

Now we go from destroying cars to protecting them and their contents from pursuers. A diagram would fit only a few of the vehicles but this explanation should be understood by anyone at all handy with cars and trucks.

First, a hole is drilled in the exhaust manifold the size of the nozzle of a paint or plant sprayer. When the nozzle is welded in place a length of gas line is affixed to the nozzle tube and fed into the driver's compartment.

The gas line is then attached to the spray unit inside the driver's compartment under the dash.

Solid brass plant sprayers going under the trade name of "Mist"ifier, or similar, can be bought at any garden store. The nozzle is removed and welded to the exhaust manifold and the container is put inside with the driver and connected to the nozzle unit with a length of gas line.

To use, the container is filled with castor oil, bought at any drug store. Burned castor oil will blot out everything on the road behind you.

A friend tried this and just put in a few short squirts to see what it would do. The effect from his exhaust pipe was so wild that it looked like a bomb had been dropped on the freeway.

He was so startled he allowed himself to be pulled over by a cop and he almost got locked up for it. He could have gotten away if he had made a smokey run for it.

It is the hot exhaust manifold which turns the castor oil into smoke. Smoke screens in war are made using this simple principle. Crank case oil to be thrown away is great for smoke screens. It could also highlight the idea of recycling in your area.

On the road, the smoke not only causes pursuers to slow down in order to see, but it causes panic among the other motorists on the road. This makes the police stop the chase as the traffic hazards are greater than your capture is worth.

POISONS

Since this section was written, in 1970, I've run across a terrific book you'll want to get from your library or order through your local book store. It is "Poisons, Antidotes & Anecdotes", by William Tichey and published by Sterling Publishing, 1977.

It is the most fun book and will give you oodles of ideas as well as tell you how poisons work.

Also, I've incorporated "The Complete Medical Student's Manual of Chemistry" into GRANDDAD'S WONDERFUL BOOK OF CHEMISTRY. This manual has the most extensive writings on poisons of any book I've ever seen. Under the headings of "Action on the economy", it describes how much of what will do in an opponent and how he will react and for how long before he croaks.

PLANT POISONS

Plant poisons are very easy to administer and are hard to trace. A few leaves in the salad aren't noticed and the victim dies without knowing why.

Rhubarb, for one, is a deadly poison. The stalks are fine but if you eat any of the leaf, you'll die. Cooked, the leaves take an hour or so, but in a salad they kill almost immediately.

The rhubarb bought in stores has all the leaves taken off so you will have to get the leaves from a farm or grow your own.

You don't have to be stingy with rhubarb and most other plant poisons like figuring grains and grams. Just chop up some leaves and put them in the salad or stew or among the lettuce on hamburgers and you will have hit the jackpot.

Castor beans are a good poison as they are almost tasteless when ground and only three or four are enough to kill. They're easy to get, especially in Southern California where they grow wild. They can be put into almost any food.

Oleanders are common flowers but are about as poisonous as any plant. The heart is affected very quickly and severely. Both the leaves and branches are lethal.

A couple of poinsettia leaves will kill just about anybody. Better use three.

Yew is a conifer, or cone bearing evergreen tree or shrub. Any nursery man can take you out in back and identify it for you. But he will get pretty surly if you start stripping off branches so you should buy a small tree, if you don't know where a big one is growing.

It's the foliage that kills so forget the berries. It is so poisonous and so quick that at one time the Secret Service considered it for suicide pills. The beauty of it is that it kills almost immediately without any symptoms. You take it and, splatt, you're on the floor, dead.

I'm not sure of the dosage but it's not much.

The way to refine it is to fill a coffee percolator with the ground up foliage and put eight ounces of alcohol in the pot. Percolate it for about a half hour. If the alcohol boils off, put in some more.

Cheap rubbing alcohol is good enough once you have distilled it off from its water content.

When the process is finished, put the alcohol and what went through the percolator into the still. You then distill off the alcohol until you have only a couple of teaspoonfuls of residue left. Pour this out into a saucer and let it evaporate.

You can use the same process for a finer grade of nicotine from tobacco. Always strive for quality.

Laurel is another evergreen that can cause death by the eating of a single leaf. It is best percolated and distilled but it can be used as it is and put in stews and as a garnish on hors d 'oeuvres.

Poisoning was a great sport and topic of conversation before the widespread use of firearms. Now that firearms might be going out, Militants and suburbanites are becoming interested in more aesthetic ways to kill.

Unlike your gun, poison is seldom very effective against burglars. But say you've been suckered into giving a wife swapping party where every female but your own is either pregnant or periodic. In this case a little something to sprinkle on the hors d 'oeuvres is a good thing.

The Militant can use poison on individual enemies or can put it in refreshments at rallies of political opponents. It is also great for getting rid of rivals in his own group. Last, but very important, is that old standby for an embarrassing moment, the self destruct capsule.

There are several books on poisons. The best one is POISONS, by Vincent Brooks. It's mainly for doctors and police but is very readable and amusing. Most libraries have it, along with several others, which are mainly about garden plants to watch for.

I got a great charge out of reading about Warfarin on page 108 of POISONS. Warfarin is a rat poison which is mainly corn meal or some other rat dainty. Anyway, it tells how some slob was induced to eat a pound of it a day for six days. Talk about Jethro Bodine!

A word to the wise; if you're a southern type and your wife stops eating her share of the corn pone, thrash her and make her eat all the pone.

Poisoning is no pastime for an idiot. You've got to be mighty shrewd. To give a blood enemy just a bad taste in the mouth while you're sitting talking with him over a drink is dangerous. He'll suspect poison and know you tried to do him in.

Poisons act in different ways. There are four considerations when selecting a poison. Four effects for different objectives.

One objective might be to kill the victim immediately so he would be unable to talk. Another would be a several minute delay where the victim would be stricken some time after you had left the scene.

Still another consideration is that the victim should be unconcious so he can give doctors as little help as possible. Also, you don't want him to hurt any more than necessary because that would be mean. The fourth consideration is that the dose is strong enough to be lethal.

As you apply yourself to this study you will occasionally blunder. Your victim will be down, flopping like a fish off the hook and the medical types will still pull him through. I know this is frustrating, but one must learn to cope.

Another good thing to know about the poison of your choice is its legitimate use. If a druggist or someone else asks you what you want with it, it's embarrassing to have to admit that you want to kill someone. A cover story is always good.

ETHYLENE GLYCOL

This is simply antifreeze, such as Prestone, Zerex, etc. Always read the can to make sure the ingredient is ethylene glycol. It is a colorless, syrupy liquid with a sweetish taste. It mixes well with both water and alcohol.

Authorities disagree on the lethal dose. They put it from a half ounce to four ounces. This is not important, however, as anyone will drink four ounces in his soft drink without becoming suspicious.

It can also be tasted along with what you've put it in. Just wash your mouth out and you will feel no bad effects.

At a party, a half-gallon at a time can be dumped into the punch bowl so that everybody will get his share. Only don't pour it in directly from the anti-freeze can. An observer might wonder about you. Instead, put some food coloring or Kool-Aid in it to make it look like grape juice or something and put it in two-quart fruit juice cans.

That way you can pour it in the punch and stir it and grin and anyone watching would think you were just helping.

A nice thing about ethylene glycol is that a person dying from it just seems drunk.

ARSENIC

Arsenic and its compounds are great poisons. They are quite popular and have been a good subject for comedies such as "Arsenic and Old Lace." The nice thing about arsenic is that it is almost tasteless and it doesn't start to act until a half hour to an hour after it is taken. That way you can zap just oodles of people who would get off scot free if you used a fast poison like cyanide. Cyanide is terrific for individual hits but disappointing when working with groups.

Say you're operating at a governor's banquet and you lace the grits with cyanide. One of the victims would be eating a handfull of grits and would all of a sudden flop over into his gravy. His neighbor might swipe his pork chop but you can be sure he would not touch the victim's, or his own, helping of grits. He might even warn others.

But with arsenic, they'll all be to their prunes by the time the poison takes effect.

The lethal dose of most arsenic compounds is from 0.1 to 0.5 gram. A gram is only 1/28th of an ounce. Say you had a pound of arsenic or arsenic trioxide, etc. Say, also, you allowed the maximum dose of half a gram. That would be 896 fatal doses. There would be enough left over to take care of the Senate and Congress and even Billy James Hoggis.

SODIUM FLUORIDE

This is rat and insect poison. It's a real killer. It can be bought at hardware and garden stores in an adulterated powder. Chemical supply companies sell the pure stuff for $.35 an ounce.

You can make it yourself with hydrofluoric acid and sodium carbonate (sal soda).

Use only plastic when working with hydroflouric acid as it eats glass and metals. Also work with good ventilation and avoid the acid fumes.

Put one part sodium carbonate in a plastic container and add an equal amount of acid, slowly, stirring all the while. The result will be colorless crystals and white powder.

Death has been caused by less than one grain. There are 437 grains to an ounce so a grain would be about the size of a grain of rice or wheat.

In case you didn't know, sodium flouride is the waste matter from certain chemical companies which they unload on moronic city officials, like those in Eureka, to fluoridate the drinking water. It might toughen kid's teeth but it also dulls the creative part of the mind, even at one part per million in drinking water.

POISONS doesn't say if the full strength stuff is fast or slow to act or how long the victim lasts. Testing is in order here.

NICOTINE

Nicotine is a really terrible poison. One drop of pure nicotine has killed in fifteen minutes. It is great to put a few drops in an opponent's shot glass and make a bottoms up toast to Senator Fulbright.

Its taste is pretty well covered by wine, especially sweet wine. It's not so good in drinks that have to be sipped and savored. Few poisons are.

You can get almost pure nicotine from the kind of snuff that comes in round, flat boxes. Pour it out into a water glass and put in just enough water to cover it all.

After about 24 hours pour the mess into a handkerchief that has been stuffed down into another glass but with its edges over the rim. Then lift out the handkerchief and twist the edges so that the snuff forms into a ball. Continue twisting until all the liquid is squeezed out.

Pour the liquid into a small sauce pan and put it on a low fire. When the liquid has evaporated to about a teaspoonful of thick syrup it is finished. It is best to dilute it with enough water so it will easily leave a medicine dropper. A few drops should do the trick.

A good way to handle nicotine is to fill a medicine dropper with it and plug the end with a piece of soft wax which is pushed in and molded around the opening. The dropper is carried with the wax end up in the shirt pocket and is ready for use in a jiffy.

Nicotine is also a good way to commit suicide if you are a prisoner. Just collect a handfull of cigarette butts and strip the paper from them, if you are a neat person.

Soak them for several hours, if possible, in water. If you are being watched you can slip them into your coffee. At the last minute just gulp the whole thing down. Best to do it on an empty stomach. If you keep your mouth shut for a few minutes, even if they pump you out it will be too late.

Nicotine is an alkaloid so you might get quite a high while you die. Give it a try.

NICOTINE SULFATE

This is my favorite. It is an insect poison found under several brand names. The most common is Black Leaf 40, bought at any garden store. This stuff is 40% nicotine sulfate. Just a few drops in a drink will kill quickly.

It is best to evaporate it to the point where it is like a thin syrup and will still form into drops from a medicine dropper.

One of the glories of nicotine sulfate is that it is absorbed by the skin and is fatal within a few minutes. Death by nicotine sulfate can only be detected by a blood test, which is seldom given.

A fine way to use nicotine sulfate is to carry it in a soft drink cup and act like you accidentally spilled it on the victim. If he doesn't wash it off in a matter of seconds he will be dead in a matter of minutes. There is little chance of him washing it off if he thinks it's just a soft drink, especially if he is at a meeting or talking to someone.

Most other insect sprays and powders kill by being absorbed through the skin. Some of them are: Malathion, Parathion, Chlordane and Lindane.

TESTING POISONS

At first thought it would seem that the best way to test poisons would be on alley cats. Cats are not the best subjects because, first it's naughty to hurt cats and also because they are hard to kill.

Alley cats eat such garbage and corruption they develop cast iron stomachs. A cat can often handle a dose that would kill a dozen people.

The best subject is a wino. In every city there are hundreds of winos sleeping out in nests in vacant lots, abandoned houses, under bridges, etc. It's very easy to find such nests. They are usually made up of flattened cardboard boxes and newspapers and littered with wine bottles.

Put the dose you want to test in a half full fifth bottle of sweet wine. Then tuck it in the nest where the wino will be sure to find it. He will just think another wino hid it there.

If the nest has a dead wino in it the next morning you've figured out the right dose. If both the nest and the bottle is empty, it's back to the old drawing board. Try increasing the dosage.

I was going to test poisons myself in this way. Then I realized I would probably wipe out half the Eureka City Council. Even so, they deserve it, since they all voted to put sodium fluoride in the city's drinking water.

Most poisons can be tasted to see what, if any, flavor should be added to hide the taste. It's quite safe to put a little bit on your tongue to get the taste and then wash your mouth out well. The only poisons I would not taste are prussic acid and others that kill with less than a grain and strong acid or lye which would damage the tongue.

The safest way to test poisons, for you, is to put it in dope. Another safe way is to put it in an enemy's medicine. If you have access to his bathroom look for capsules, especially prescription so you know he's the only one taking them.

I saw the capsule trick on "Ironside." Clever.

Care every step along the way makes the difference between the proud expert and the red-faced bungler. Imagine the embarrassment of the ancient Greek poisoners when Socrates said, "Wow! It sure doesn't *taste* like tomato juice!"

COUNTERFEITING

Many Militants rob banks for operating expenses. It is pretty easy to get caught and go to jail for ten years, that is, if you don't get shot and killed. Counterfeiting is a lot less risky and the sentence is about the same if you are caught passing funny money. Also, found under several brand names. The most common is Black Leaf 40, bought at any garden store. This stuff is 40% nicotine sulfate. Just a few drops in a drink will kill quickly.

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COUNTERFEITING

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Ninety per cent of the arrests for counterfeiting are made on tips. If you are a lone wolf and produce the stuff all by yourself, and if it is pretty good, your chances of capture are very slim.

If there are two people involved the chances are two to one against you. If there are three people, it's three to one and so on.

The person I got this information from made the best stuff the T-Men had ever seen. He wasn't caught making or passing it. He was suckered.

The treasury people are setting up all kinds of fun and games because they are running out of work. They promise to pay informers on tax cheats, but they don't live up to their promises so people have stopped informing.

So, having nothing better to do, they approached this ex-counterfeiter and promised him $20,000 in real money to print them up a million in phoney hundreds. They then showed their badges and arrested him. They have no case since they set him up but he was mad enough to divulge the secrets of his craft.

Anyone who is good with photography and darkroom techniques can be a professional counterfeiter.

This method works, with minor variations, for any paper money from any country. I stress foreign currency because it's a stupid bird that fouls its own nest. But think of a grand tour of Europe, financed out of your own basement. It would do your head good and besides, they want your trade.

Samples of foreign currency can be bought from most coin shops, foreign exchange shops and from many of the larger banks.

Contrary to popular opinion, you can buy paper nearly identical in feel and weight to legal bills. It can be bought from any paper house in the U. S.

It is normally a 25% rag. If you go any higher in the rag content it feels too soft, whereas the 25% has the crackle that a real bill has.

The only problem with the paper is that it is absolutely white. A real bill is not white. It's a combination of greenish, yellowish brown in a very light tint. At the end of the process you have to dye the bills with the tint that matches the real U. S. currency. Foreign bills have different tints.

To begin with, you must have an excellent negative. The first way is to make the bill in the negative the exact size of the real bill. The other way is to enlarge it to about four times its real size, retouch it, then reduce it to its real size.

On U. S. currency, and particularly the 20 dollar bill, there is one very troublesome place. That is around the eyes. Some way, they have made this area very difficult for a camera to pick up.

A plate for currency is made by engraving. They take a piece of flat metal and scribe indentations in the metal. Around the eyes are very fine lines and the indentations around the eyes are very shallow.

There is very little ink in that area. Whenever it is to be reproduced by a photographic process, these lines do not register well on the negative.

Therefore, you must retouch the negative by hand so as to get these fine lines. The easiest method is to enlarge the image to twice its size or more. After the lines are put in, the image is reduced to the exact size of the real bill.

All bills are better enlarged but a twenty is the worst as far as reproduction is concerned. They have made it that way purposely because the twenty is the best denomination to pass. The easiest to duplicate is the hundred dollar bill.

Each bill needs three different negatives.

One negative is for the back, which is all one shade of green. Another is for the portrait side and is for the black. The last is for the green seal and serial numbers on the portrait side.

After you have the negatives for the back plate and the portrait plate you have two very difficult areas. The first is the little green seal reading THE DEPARTMENT OF THE TREASURY 1789. This is on the right side of the portrait.

The denomination of the bill is printed in fine black lines over the seal. These have to be touched out of the negative of the seal and the serial numbers. You have to enlarge the portrait side maybe four times its size and take out all the black parts especially the fine lines through the seal. Then it is reduced to normal size.

Then you take another negative of the portrait side and blow it up about four times. In this one you touch out the seal and the serial numbers. Then reduce it to normal size.

Now you have a complete set of negatives. You've got the green back side. You have the black portrait side without the seal or serial numbers. Then you have the green seal and the serial numbers on the right and left sides of the bill.

Next, you take the three finished negatives and reproduce them so you will have as many bills as your press handles on one sheet. If it handles 8½ by 14 inch paper you will need five of each negative.

Now it is time to get the negatives ready for the plate making operation. You will have to do the printing yourself as it would be risky trying to get a commercial shop to do it for you.

You can get a second hand 8½ by 14 offset press for about $300. You can get a simple book on running the press and describing the offset process from any printing supply company.

To get the negatives ready for the plate making they are cut to the exact size of real bills on the sides but with extra negative on the ends. Then you take a piece of opaque orange plastic and cut a hole in it exactly the size of the several bills.

Next, place the negatives side by side over the hole and scotch tape the ends to the orange plastic. This is called stripping.

Your next step is to lay the stripped negatives down on a sheet of light sensitive aluminum called a lithographic plate. It is best to have a vacuum frame so the negatives will be pressed uniformly on the plate. Then the plate is exposed to an arc light for from two to two and a half minutes.

When the exposure is complete, the plate is put into a sink for developing. First, a desensitizing solution is rubbed over the entire plate. Then the lacquer is put on. Places that were sensitive to the light pick up the lacquer, showing what you have.

When the plate is developed and lacquered, a solution of gum arabic is rubbed on the plate. This prevents moisture from oxidizing the aluminum plate.

When it is ready the plate is put on the press and wrapped around the cylinder. The relation between the position of the paper feeding through the press and the plate on the cylinder is called the register. The register must be exactly the same for all three sets of negatives so there is no overlapping and the printing is perfectly centered around the edges on both sides.

Then the printing starts. The colors on a bill are easy to match. Three inks are used; black and two shades of green. When matching inks you must consider that at the end of the job you will add a tint on both sides. Thus, the greens should be a bit lighter as the tint will darken them.

After the black plate is run it is left to dry for about two hours. Then it is turned over and the green side is run. When this has set a couple of hours it is turned over and the seal and serial numbers are printed.

There should be several sets of serial numbers. When a bill is being passed, one number is good for about a week before it is picked up and listed with banks and stores. A dozen different numbers should be made into negatives for a sizable printing.

When the three colors have been printed and the last is dry, the bills are cut apart with a power paper cutter.

(In the original text the counterfeiter recommends cutting after the printing is done and before tinting. I don't know why. It seems much easier to first tint and iron the sheets flat and then cut. There may be a reason for his sequence so I have followed his text. Another thing might be confusing; and that is in drying the printed sheets for two hours. The impression is given that the sheets are dried individually. Actually, you can stack them as many sheets high as the press permits. Only don't disturb the stack until it has set a couple of hours)

After printing you have what looks like play money with no resemblance in color or feel to real money.

The tint is a combination of yellow, green and a tiny touch of orange. It is a vegetable dye used in coloring cakes, icings and cookies and is bought at any grocery store. You can buy a little package of four different colors for $.35. This is enough to tint five thousand bills.

To make the tint you put water in a pan and carefully add the dyes while stirring. Hopefully, the tint will be too light and can be darkened gradually because if it is too dark you will have to pour it out and start over.

You will have reject bills so test the tint on them. To test, dip the bill in the solution, then press it between two layers of paper towel to blot up the excess tint. Then the bill is dried in a hot oven for about a minute and compared for color to a real bill, preferably a crisp, fresh one.

When you have arrived at the right shade of tint, do the whole batch, blotting like with the test bills and drying in a hot oven for a minute. After this it looks quite similar to a real piece of currency. But that is not the end of it.

The bills should look used. First, they are wrinkled a little. Then they are rubbed with ground coffee to give them an aged, dirty look. Then they will pass even at banks.

Don't worry about the lack of fine blue filaments in your product. Just observe some poor, harried shop broad servicing a line of impatient noontime shoppers and see if she examines the bills for tiny blue filaments. If she did she'd be fired if she wasn't torn to pieces by the mob.

BOMB HANDLING AND PROTECTION

As much fun as bombs are to use against others, most of the fun goes out of it when they are used against you. Whether you represent the government, the Bank of America or a rival Militant group, you may someday need this section so pay close attention.

By far the best work on bomb handling is Lenz's Explosives and Bomb Disposal Guide. This is described in the book section. It is heavily illustrated and is much better than my book for the identification of bomb components and bomb dismantling.

Lenz's only shortcoming, however, is his seeming preoccupation with taking the nasty things apart. My methods are safer and more practical.

If you are confronted with a bomb the best thing to do is to run and report it and so pass the buck to someone else. If you are the one to whom the buck is passed you aren't supposed to run away. You are supposed to make the area safe.

If you are a bomb squad person your first act should be to assure minimum damage in case the bomb goes off before you can dispose of it. Having done this you must next remove the bomb from the area.

If the bomb is obviously going to go off within minutes you may have to deactivate it on the spot. For this I again refer you to Lenz's book because if you are in the business you have no excuse for not having his book.

There are four basic types of bombs: shatter, concussion, shrapnel and fire.

Shatter bombs are those relying only on the actual explosive matter to do the damage. These include chemical explosives enclosed in plastic or paper, blocks or molded plastic explosives or bare sticks of dyanamite.

Shatter bombs have a very short radius of damage. Anything from a half ounce or a couple of pounds will only shatter in a radius of a few inches. You have no doubt heard of a soldier stepping on a land mine and having a foot sheared off at the ankle. Then there is the dynamite fisherman who loses only a hand when he holds a stick too long.

Photo shows complete spatula and plastic medicine bottle on left and exploded spatula on the right.

The photograph shows a spatula which had been used to stir a mixture of about ½ ounce of potassium chlorate and a bit of red phosphorous. The mixer was ignorant of the fact that these chemicals together, stirred dry, will detonate spontaneously.

The resulting blast kneaded the spatula out of shape. It atomized the first 3/4 inch of the bone handle and split the rest. It shattered the plastic mixing bottle.

The fingers holding the bottle had the flesh blown off the bones and the bare bones had to be amputated. The palm of the hand was turned to hamburger and its inner bones were smashed.

The hand holding the spatula was undamaged except for particles of plastic bottle which pierced the skin.

So the shattering effect, although terrible, was only in a radius of about two inches from the outside of the charge of explosive.

Examine the photos of bomb "expert" Norman Hill. He had been fooling with a bomb the size of a pack of cigarettes and it blew his hand into a bloody mist. Otherwise he was not harmed.

This also shows that the shattering effect was only a few inches and concussion was not a factor here.

The second picture points out his foolishness in previously playing with a similar bomb. Note that he is ridiculously bundled up in the most elaborate blast protective outfit. Yet, assuming this was a similar bomb, his body was in little danger. But his vulnerable hands, the parts of him that are endangered,

are bare!

I saw many such pictures during the recent rash of letter bombings. Bomb squad people would be wearing useless vests and carrying the vile letter bombs in their bare hands. Ignorant!

I don't usually moralize about such things but letter bombs are the mark of a creep and a no-class coward.

First, bombs which usually only cripple are no-class. If you are a Militant, regardless of your feelings now, you will change in time. When you are off on another trip you may regret having some victim still crippled for life and suffering.

A case in point is Rennie Davis. I don't know if he ever made a bomb but he was a high priest of the Yippies calling for the end of the establishment. It is impossible to reckon the damage he encouraged with his anti-government speeches.

Yet he has sensibly outgrown the leftist movement. He is now a spokesman for the fat little Indian degenerate, Guru-Maharaj Ji. I wonder if he ever considers the still crippled police his kind produced when they were so right and all-knowing.

At any rate the letter bomb is the lowest of the no-class weapons. It usually gets some non-involved postal worker or secretary. Anyone so cowardly that he can't deliver his weapon to the target is beneath contempt.

Concussion bombs are those meant to lift and move. These send out a shock wave which pushes out walls, buckles steel tanks and raises roofs. They are usually bare chemical bombs or dyanamite.

Shrapnel bombs are meant to send out bits of metal or other hard debris which will puncture people or objects. This would include a pipe bomb as opposed to a bare stick of dynamite.

Fire bombs are usually containers of combustible liquid ignited by a chemical or fire fuse. They may also be cans or bottles of liquid set off by dyanamite or other explosive.

Having found a bomb, if you aren't sure you can get rid of it, you should pack it around with stacks of tied newspapers. Such simple stacks around the bomb and between it and the target will take up most of the shattering effect. They will also act as an excellent buffer to the concussion. They will absorb a blast that would otherwise blow out every wall in a room.

About ten two-foot high stacks of newspapers carried always in the bomb vehicle should protect a lot of property.

If you are lucky your bomb is loose and is probably not going to go off right away. Your next job is to get it away from the scene.

This is best accomplished by using a carrier made of ¼ inch steel and opened at one end. The carrier's bottom part is swung out and it is lowered over the bomb. The bottom is then swung in toward the bomb, the sharpened edge sliding under the bomb and picking it up.

The carrier is then lifted and taken to the bomb vehicle. The open end of the carrier is held facing the least valuable area while the closed end also faces away from people.

If the bomb is sizable and should go off the carrier will be ruined. But there is much less chance for the officer to be injured than without the carrier. The carrier will be jerked from the officer's hand and sent in the direction of the closed end. The main effect of the blast would go out the open end.

That carrier can be made by any blacksmith, boilermaker or welder who works with ¼ inch metal sheeting. The price is around $50.

The design shown is simple and can be made in a few hours. Any metalworker can understand the plan and may even improvise improvements.

A steel rod is welded to the back of the bottom part. It goes through a hole drilled into the top part and is bent over the handle as shown. The rod is also secured to the inside back of the carrier by a welded band.

A half inch extension is welded to both sides of the bottom of the front and the middle of the back. The weight of the carrier rests on these extensions. The bottom, which is actually a large blade, rests alone and swings free of the extensions.

In case you have carried the bomb out to the bomb vehicle and packed it in amidst bundles of newspapers you are pretty safe. The next thing to do is take it to an empty space and shoot it.

It is ever so much fun to stand off and bang away at a bomb with a shotgun. Use 0-0 buckshot. Most likely the bomb won't explode but shooting it to pieces is far more relaxing than interrogating winos.

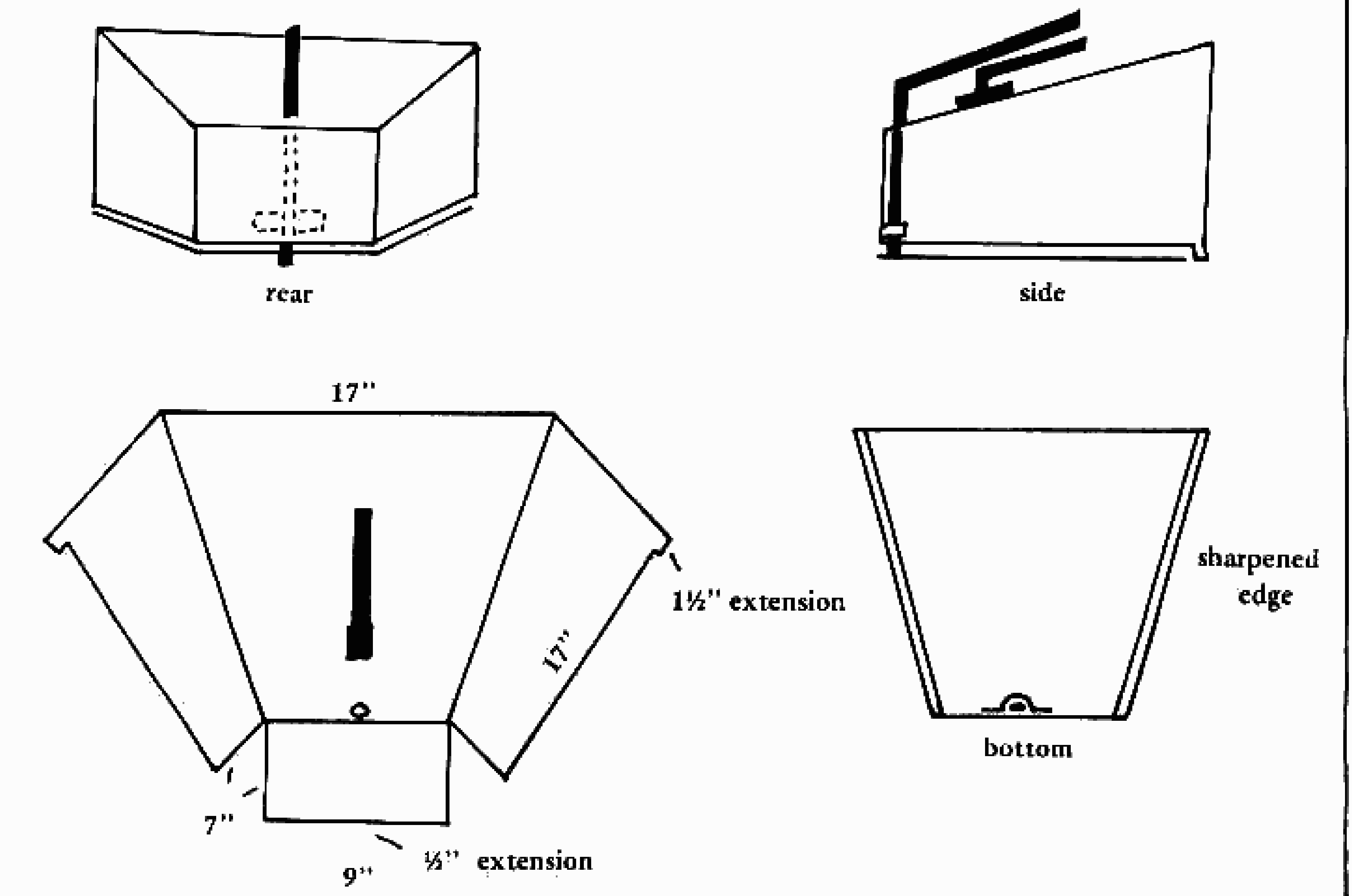
I can't see any reason for taking a bomb apart unless it is about to go off and is chained to an important target. But in case you *have* to disarm a bomb you should have a pair of galvanized hand protectors.

These goodies would have saved Norman Hill's hand and that fellow stirring the chemicals wouldn't have even lost a fingernail.

I don't encourage making explosives but if the manipulations were performed with these hand guards the most potent explosives could be made safely in batches under four ounces. It almost goes without saying that the homemade face and body armor described further on is a must.

Any amateur can make a pair of these hand protectors in an afternoon.

First go to a sheet metal shop and buy two 19½ by 9 inch pieces of galvanized sheet metal. Then get a pair of tin cutters, some picture hanging wire and a 1/8th inch drill.



STEEL BOMB CARRIER

From a drug store buy two pairs of crucible tongs and dip their ends in liquid rubber bought at any hobby shop. About four coats, well dried after each dip, should make the tips so they can be used to manipulate the finest wire.

First cut the sheets in half circles of 19½ by 9 inches. Cut a notch 1¼ inch deep by 2½ wide 8½ inches to the right of the right hand one and to the left of the left hand one. At the appropriate ends of the notches cut smaller notches ¼ inch deep by 1 inch long.

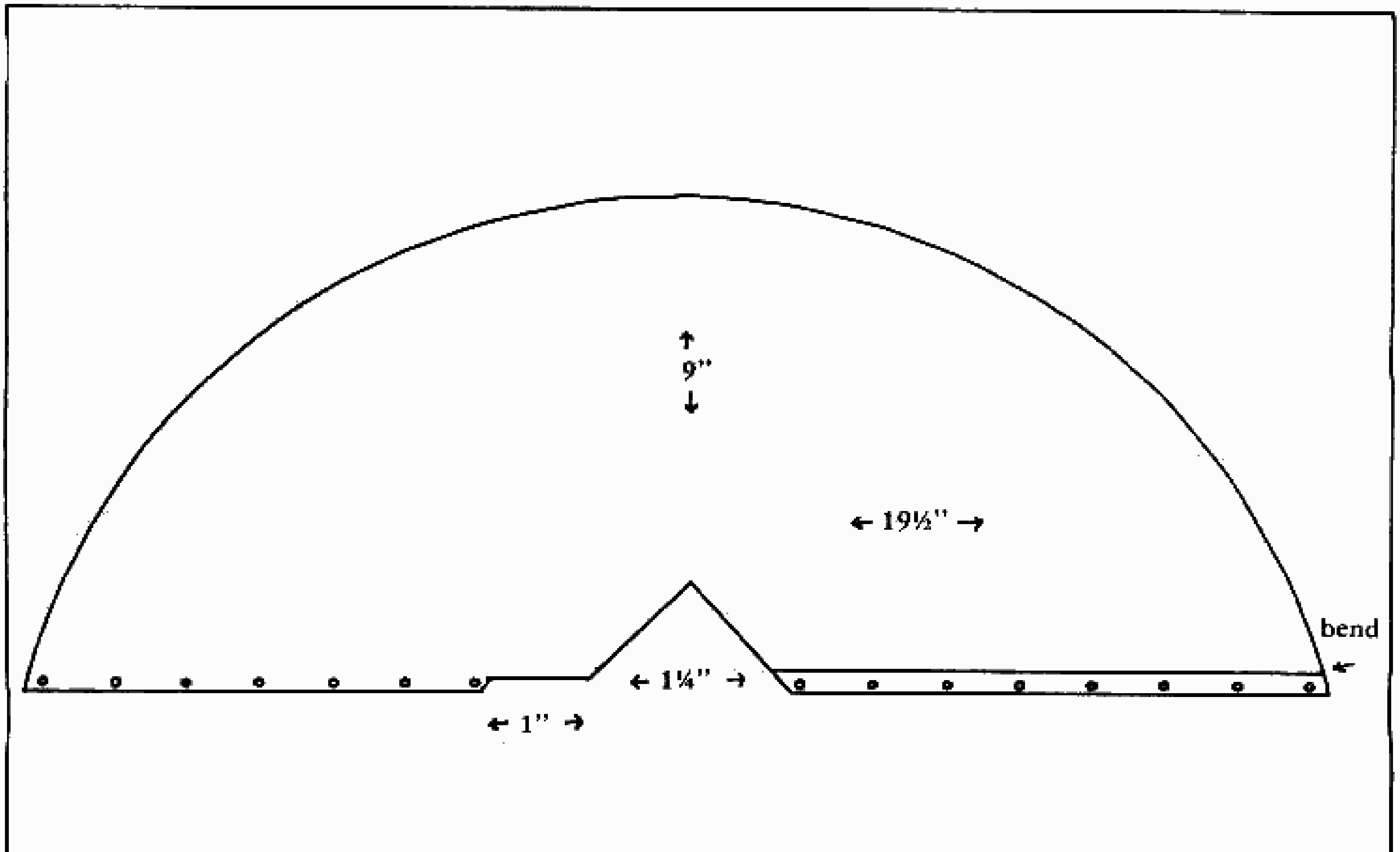
Next, drill seven 1/8th inch holes in each side of the notches. Then bend the drilled edge opposite the small notch to a V.

When the bending is done you next lay the tongs on the metal and bend the half circles entirely so that the drilled edges join and one edge is in the V bend of the other. Then stitch the picture hanging wire through the drilled holes and the job is done.

Holes can be drilled around the rounded edge to accommodate wires holding elastic circlets. In this way the protectors will hang on the wrists without the need to grasp the tongs. You may not think such circlets necessary so they are optional.

When brought to full width the tongs will handle the largest pipe bombs. Even so, I recommend using the carrier for pipe bombs and any other explosives with fragmentation sheathing.

The hand protectors will withstand ever so much concussion but an exploded pipe bomb would give you a couple of pretty battered hands. Therefore, a pipe bomb should be



GALVANIZED HAND PROTECTOR

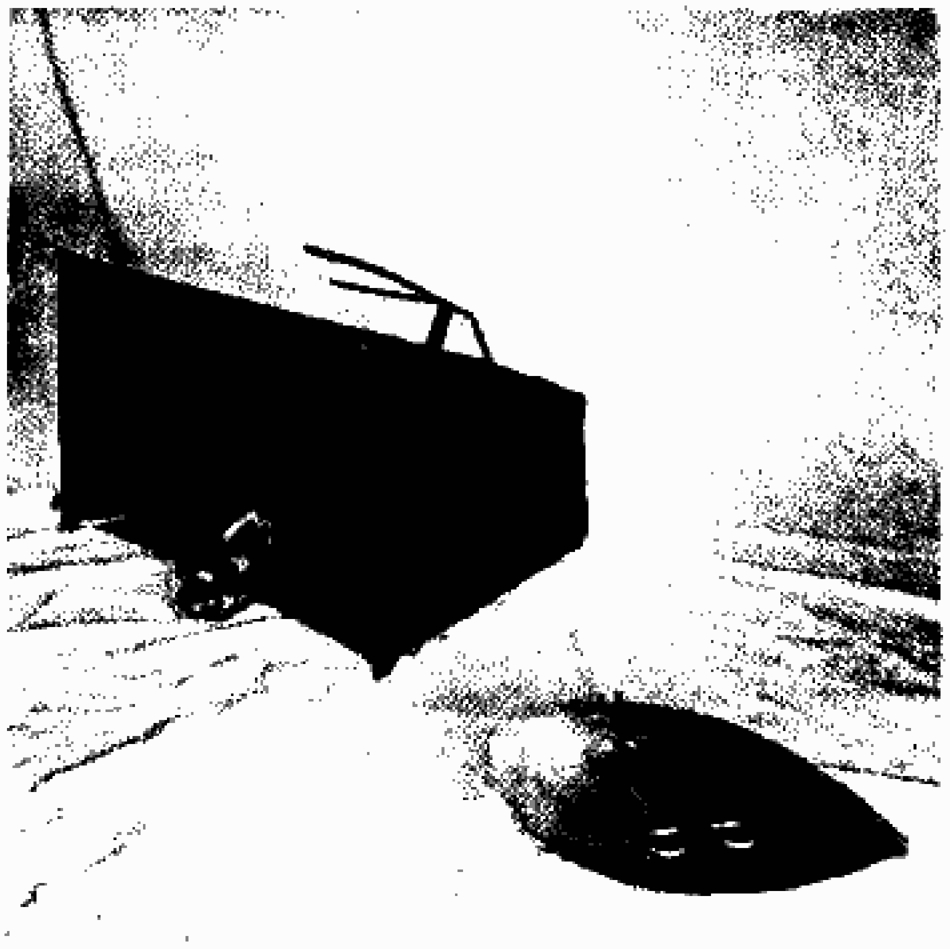


Photo shows galvanized hand protector and steel bomb carrier.

handled only long enough to get it into a carrier. If you must use your hands then the protectors would certainly be better than nothing.

The elaborate bomb suits shown are very expensive but easy to duplicate. They are mainly fiber padding to absorb the concussion and any bits of shrapnel.

Instead of spending up to $300 for a bomb suit a fireman can make his own for $5.00 if he is at all handy or has a wife.

All you need is a pair of coveralls with a slit in the back. As in the illustration you sew on pockets made from blue jean material, reaching around the legs and arms and on the upper and lower torso. In these pockets go tightly packed newspaper at least two inches thick.

For the head you will need a curved piece

of galvanized metal with eye holes. A complete pocket is also made for the head. An inch thickness of paper is put in front of the face plate. Eye holes are cut out as well as a slot for the nose.

A ¼ inch strip of clear plastic is glued over the eye holes of the face plate. Then an inch more of paper with eye holes is slipped in back of the face plate.

An elastic strip sewn to the face mask and going over the top of the head is joined at the back by one sewn to the sides.

Such a suit can be carried in back of a fireman's car and be slipped on much quicker than the many-strapped and buckled examples shown here. I believe they were designed for going in after gunmen.

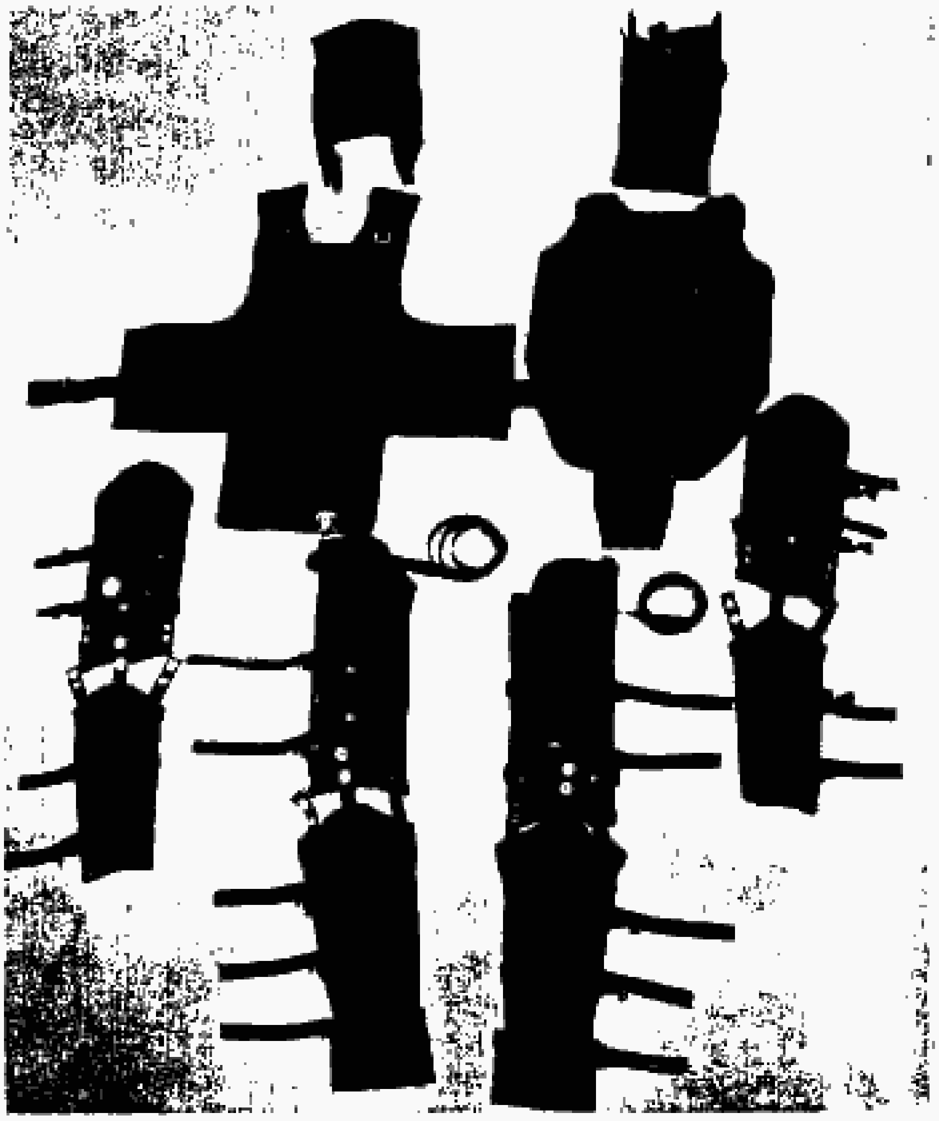
The thirty-five buckles and snaps would take several minutes to put in order. This detracts from the fantasy of the heroic bomb squadder with only seconds to prepare to disarm a ticking monster. Actually, most bombs are dormant when found. They didn't go off as planned and the only real risk is that they will still go off accidentally.

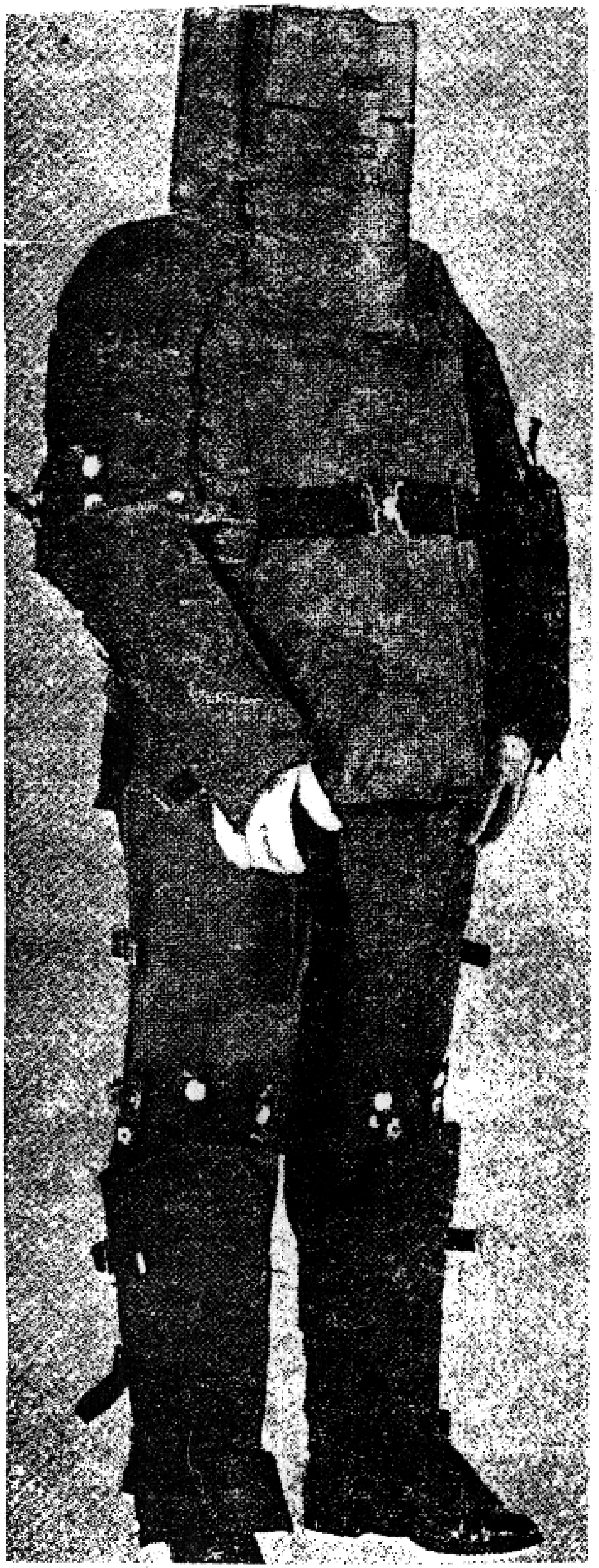
The fact that my suit is Mickey Mouse and cheap should not discourage you. It will absorb one hell of a concussion and a lot of shrapnel. It will be ruined and need replacement but you will probably walk away.

It is certainly as good as the other padded suits shown. The suit with all the straps does not seem to be padded but instead seems to be made of metal plates. This would not absorb a concussion or shrapnel.

Its safety factor would lie in its overall impenetrability. Wearing it, you might not be pierced but would probably get knocked down. And it would certainly be very heavy. I prefer the padding and I think padding is most common.

At any rate you can see that bomb disposal is dangerous but not mysterious. You should read Lenz's book and just hope for those ro-

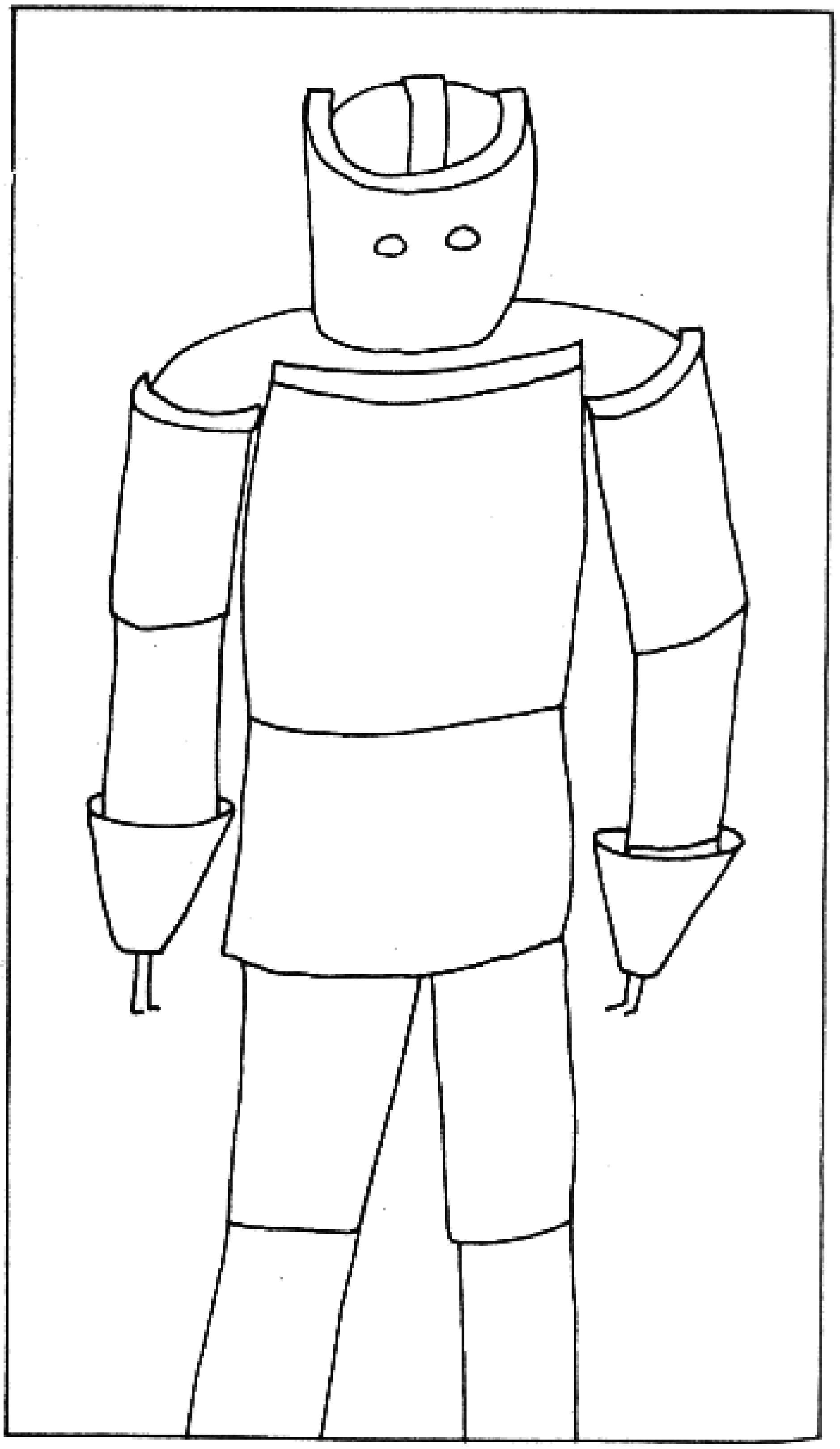




mantic jobs, like on TV, where the clock hand is about a minute away from WHAMMO!

Most properly made and activated bombs go off before they are found. What you will most likely get are duds. Don't short yourself on knowledge, however. But don't go overboard on elaborate equipment, either.

The main reason for making your own equipment is that you will have more confidence in it. It is also cheap enough that you can take it out in the woods, tie it to a tree, and test it against various blasts. You can't get such knowledge when you are assigned the expensive gear.



Handmade Bomb Protection Suit

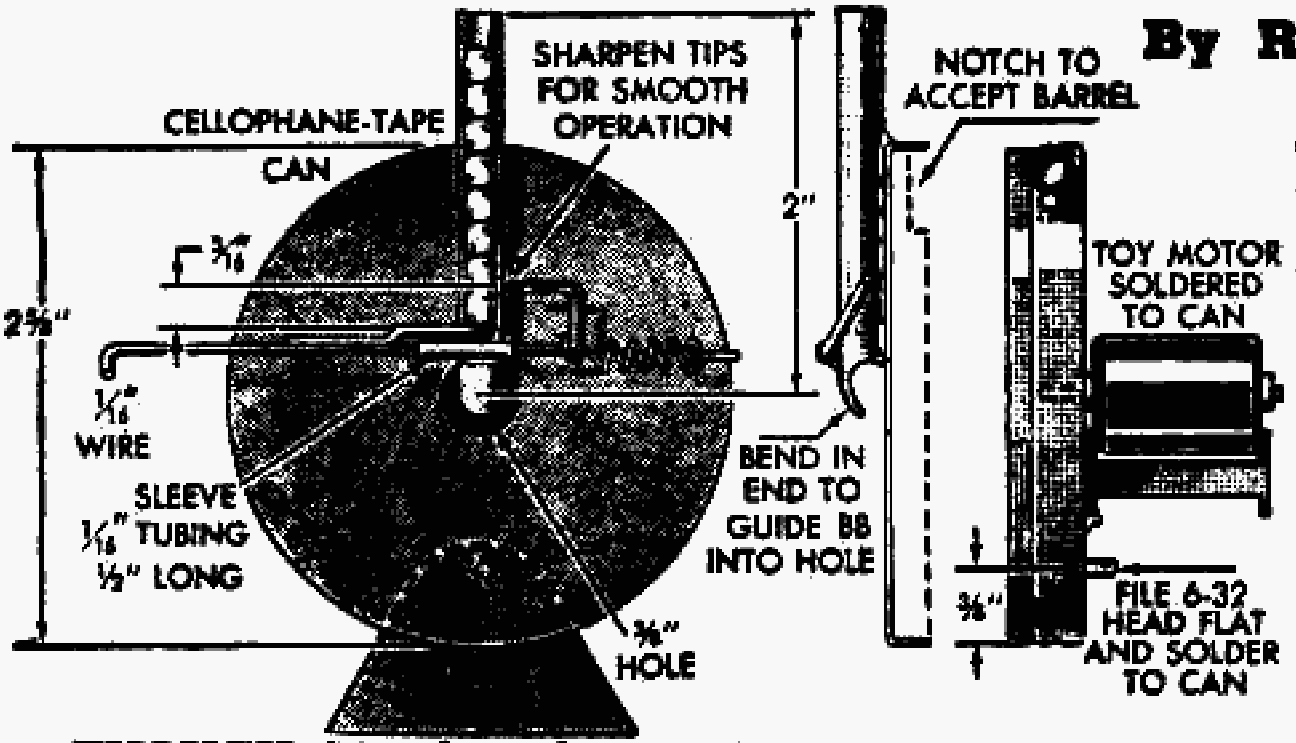
THE CENTRIFUGAL GUN

This diagram and short description, sent by a friend, does not show the connection between the two batteries and the motor. Even so, one going so far as to build the model will find the hookup elementary.

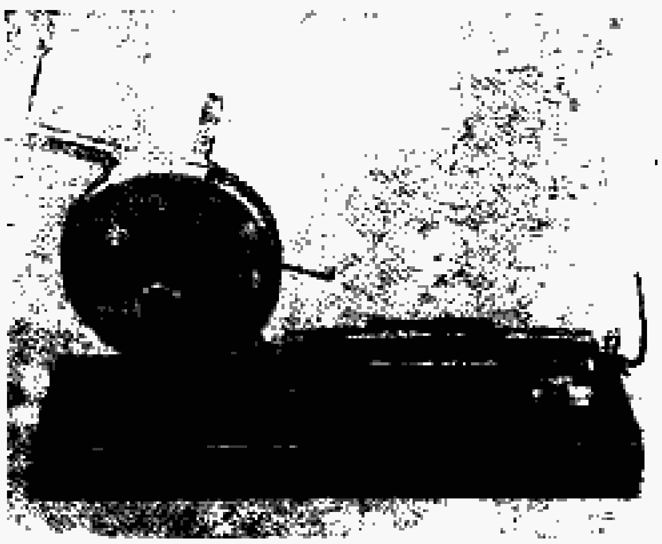
The centrifugal gun, described in The Scientific American, 1861, is obviously a workable concept. The 1861 article, reprinted in THE WEAPONEER under the title "The Baltimore Steam Battery", is a weapon you might consider. In it was described such a gun which shot two-inch balls 150 yards through three one-inch pine planks and landed from three to four hundred yards beyond, powered by human muscle.

Imagine a machinegun, powered by steam, gasoline or electricity, no gunpowder, and silent! I can't see why it was never used, since its 1837 prototype worked and a steam-powered model was patented in 1859. The toy model shown here obviously worked.

It would be interesting to see how the ATF would react to a fully automatic gun using no powder, and thus not being a firearm, and being silent without the use of a silencer.


CELLOPHANE-TAPE CAN
SHARPEN TIPS FOR SMOOTH OPERATION
2"
NOTCH TO ACCEPT BARREL
3/16"
2⅝"
1/16" WIRE
SLEEVE 1/16" TUBING 1/2" LONG
TOY MOTOR SOLDERED TO CAN
BEND IN END TO GUIDE BB INTO HOLE
3/8" HOLE
3/8"
FILE 6-32 HEAD FLAT AND SOLDER TO CAN

By Roy L. Clough, Jr.



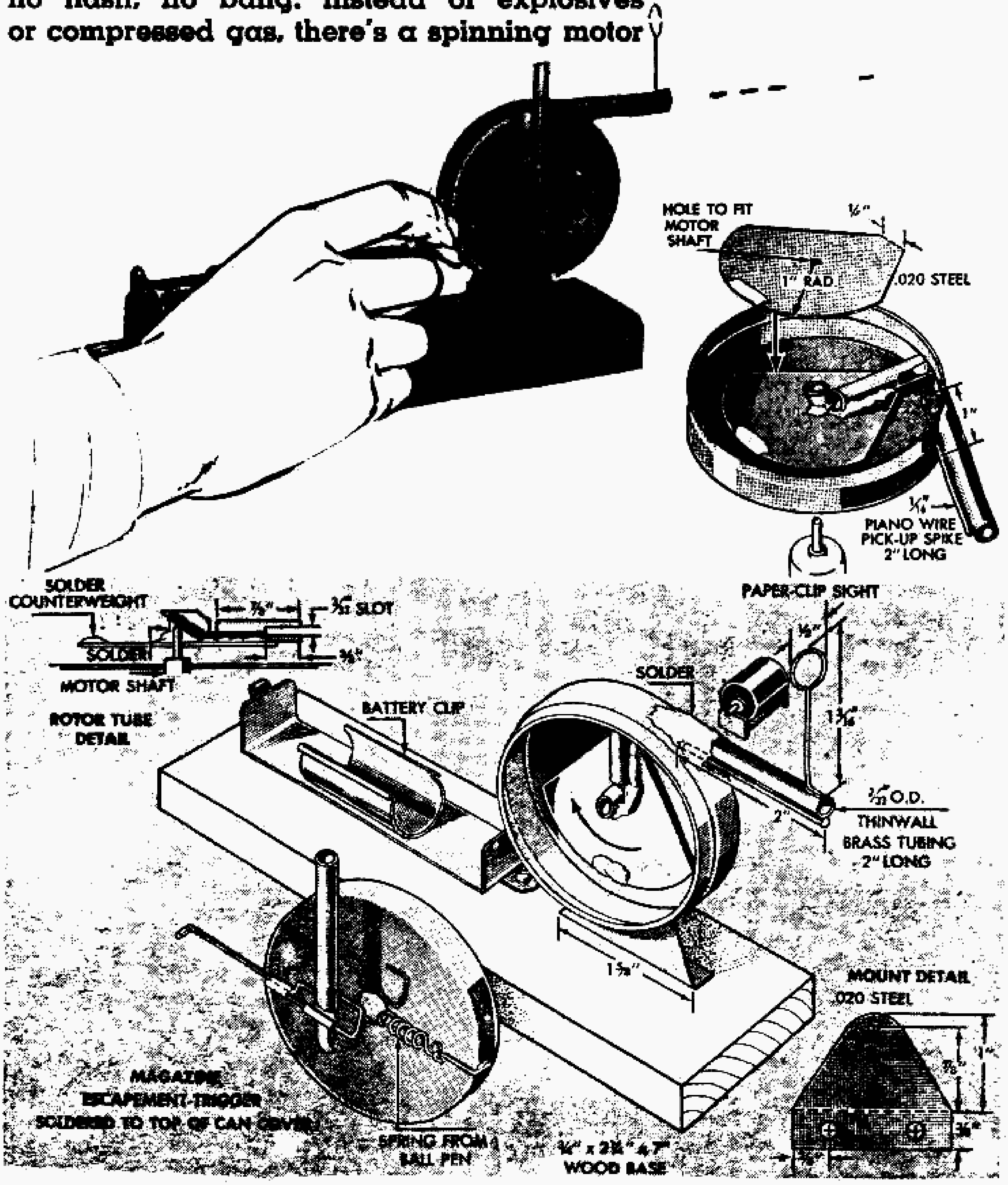
THOUGH this silent shooter throbs with electric power, it's based on just about the oldest ballistic principle on record—the one that helped David clobber Goliath with a sling: pick up a missile, spin it to gather force, then let go. *Wham!*

Not that this cannon is any giant-killer. We kept it small to be on the safe side. But it's a great demonstration of centrifugal power, and it'll shoot a BB 25 or 30 feet at a muzzle velocity of around 25 feet per second. This may set you thinking of the potential of a centrifugal gun whirled by a gas turbine at, say, 20,000 r.p.m. With an effective swing radius of about 6 in., you'd get a muzzle velocity of over 5000 f.p.s.—better than a high-powered rifle!

The spin mechanism is simple and cheap to build. The toy motor is mounted by soldering its lugs or bushing (or both) into a hole in the bottom of a cellophane-tape can. The rotor that's spun by the motor shaft consists of a base plate to which is soldered a short tube, bent and slotted to allow free passage of the BB shot. This unit must turn without binding; the pick-up spike must pass freely through the end slot. Bevel the opposite end of the tube flush with the top of the can cover.

The end of the magazine tube is undercut and bent so the dropping BB enters cleanly into the whirling pick-up tube. A large paper clip provides wire for the trigger. Pulling back on it releases one shot while blocking the others. This lets the rotor recover its speed between shots.

It spits BB shot with a hum and a click— no flash, no bang. Instead of explosives or compressed gas, there's a spinning motor


HOLE TO FIT MOTOR SHAFT
1/8"
1" RAD.
.020 STEEL
1"
1/16"
PIANO WIRE PICK-UP SPIKE 2" LONG
SOLDER COUNTERWEIGHT
7/8"
3/32 SLOT
SOLDER
3/8"
MOTOR SHAFT
ROTOR TUBE DETAIL
PAPER-CLIP SIGHT
1/2"
SOLDER
1 3/16"
BATTERY CLIP
7/32 O.D.
2"
THINWALL BRASS TUBING 2" LONG
1 5/8"
MOUNT DETAIL
.020 STEEL
1"
7/8"
3/8"
3/8"
MAGAZINE ESCAPEMENT-TRIGGER SOLDERED TO TOP OF CAN COVER
SPRING FROM BALL PEN
1/4" x 2 3/4" x 7" WOOD BASE

Gunpowder

This gunpowder is more like the old-fashioned gunpowder used before smokeless powder was invented. It is quite powerful when made right and properly confined but is still not as good as smokeless powder, which is really guncotton.

The formulas here are for what is known as black powder, to distinguish it from smokeless powder.

The simplest black powder is meal powder, mixed dry. This is used mainly for fireworks.

The general formula for black powder is, by weight, 15 parts potassium nitrate, three parts powdered charcoal and two parts sulfur. The ingredients are ground, separately, as fine as possible, or fine enough to go through a 100 mesh screen.

For a better quality powder, add one-half part of dextrine or one part Lepage's Mucilage and enough water to form a thick mush. Stir and mix well and then rub it through a window screen in a thin layer on waxed paper. A lot will stick to the bottom of the screen. Let this dry until it can be scraped off without the particles going back to mush or being so dry as to become powder.

When the particles are firm but slightly damp, sprinkle them with one-half part fine graphite. Then put them in a round bowl with a plastic cover and gently swirl them so they will become round and uniform.

Next, put them on the window screen and shake it gently until all the proper sized pellets have fallen through. Press the larger pellets through the screen into the bowl and swirl them again and keep this up until all the pellets are uniform or until you are no longer amused.

Even better powder can be made by substituting undistilled rubbing (70%) alcohol for plain water.

Gunpowder, both black and smokeless, can be bought at sporting goods stores. It is used for reloading. It has to be signed for but a person who practices at a rifle range and loads his own can prove a legitimate reason for buying tons of it. He can funnel off any amount of it for other purposes.

All grades of gunpowder are suitable for making bombs and grenades. Of course, commercial powder, and especially smokeless, is more powerful than anything you can make at home.

Of the smokeless powders, Bullseye Pistol Powder is the most potent. The strength range is, first, smokeless pistol powders, then rifle powders. Next, commercial black powder and last, the homemade kind.

Fuse

The simplest fuse is made from gunpowder mixture, using the dextrine or glue but omitting the graphite. A length of cotton twine is stirred in the mush, which is wetter than that to be used for gunpowder, and when well coated it is hung up to dry.

If a thicker fuse is wanted, the coated string is folded along its length once or twice, depending on how thick you want it. Then a heavy object is attached to one end and spun, twisting the strands. The other end of the fuse and the heavy object are secured so the strands will remain twisted until dry.

The dried fuse, whether one or more strands, is stiff and brittle. With any bending the powder drops off in spots, making it burn unevenly. If your fuse is going to be handled or will be out in damp weather, you should make some Micky Mouse safety fuse.

Up to three feet of masking tape is unrolled and placed sticky side up on a table. Three-quarter inch wide tape is used for one-strand fuse and one-and-one-quarter inch wide tape is used for the four-strand fuse.

The dry fuse is simply laid along the tape's edge and the tape is rolled over it until it is nice and tight. It is then cut into the desired lengths.

A more sophisticated safety fuse is made by coating the fuse with spray-on plastic from an aerosol can. When this dries the fuse is coated with rubber mold compound, bought at any hobby store. The plastic is used first because the mold compound has a water base and would wet the fuse. The rubber would dry but the fuse would stay damp indefinitely.

Fuses of all kinds are best lit with the material used to ignite highway flares.

Commercial safety fuse is almost impossible to light with a match. Coating its end with flare igniter makes it easy to light and also keeps loose powder from dropping out the ends. This also applies to homemade or other fuses.

Flare igniter is gotten from highway flares you can buy from any auto supply or surplus store for as little as $.15 each. The black igniting core is dug out, crumbled and dissolved with carbon tetrachloride, bought at any auto supply store.

Carbon tetrachloride is commonly used for dissolving grease from auto parts. Just enough is used to dissolve the igniter and it is then evaporated off in a well ventilated area as the fumes are harmful.

The gray powder is then mixed with just enough water to make a thick paste. The fuse ends are then dipped into the paste and dried.

The most difficult to light fuses are easily lit by a match or even with a drop of sulfuric acid.

If you don't want to waste a lot of fun flares you can make your own ignition mixture, which is the same stuff as found in flares.

A lifetime supply of the black part is made with 1½ ounces of black antimony sulfide, 2½ ounces of potassium chlorate and one ounce of dextrine or 1½ ounces of Lepage's Mucilage.

The black antimony sulfide and the potassium chlorate are both wet before being mixed. If they are mixed dry an explosion can result. Then add dextrine or glue and enough water to make a thick paste.

You don't need much of the red striker mixture. One striker can be used to light many fuses.

The red striker mixture is made with 1¼ ounces of red phosphorus, ½ ounce of dextrine or 3/4 ounce of Lepage's Mucilage (from the dime store) and 3/4 ounce of fine sand. Enough water is added to make a paste, slightly thinner than the black paste.

The striker is a tongue depressor, bought at the drug store, or any similar light, thin piece of wood. A couple of inches of the striker is smeared with the red paste and allowed to dry. The red paste should be stirred well before using as the sand will sink to the bottom after a time.

Sulphuric Acid

MAKING SULPHURIC ACID

GRANDDAD'S WONDERFUL BOOK OF CHEMISTRY has directions for making a wide range of needed chemical compounds from easily gotten raw chemicals. Those directions were taken from DICK'S ENCYCLOPEDIA OF PRACTICAL RECEIPTS AND PROCESSES, first published in 1872. DICK'S failed, however, to give a simple method of making sulphuric acid. Its compilers obviously thought sulphuric acid would always be so easy to buy from commercial producers that individuals would never need to make it.

DICK'S method of commercial production (3855) is too complex and the simpler method, credited to Nordhausen (3858) is too sketchy. It is also impractical, although you can easily modify the multi-flask method I found in the AMERICAN MECHANICAL DICTIONARY, 1876, to a one flask setup if you want to try it.

Since the home manufacture of sulphuric acid is so important, I have included it here. The simple chemicals needed are: sulphur, bought at any garden store, calcium chloride, (4247) and iron (ferric) oxide, which is simply iron rust.

The glassware can be bought from any chemical supply company or even from your local pharmacy.

The following instructions will enable you to make sulphuric acid, nitric acid and Turkey-red oil, used in dying. The methods here are for making small quantities but you can modify your setup for making larger amounts.

Essentially, sulphuric acid is a thick, oily, water solution of sulphur trioxide. Concentrated acid is made commercially by the "contact" process in which sulphur dioxide, produced by burning sulphur or roasting iron pyrites, is passed over a heated catalyst, which causes it to combine with oxygen of the air to form sulphur trioxide. Since the finely divided sulphur trioxide cannot be dissolved directly in water, it is added to concentrated sulphuric acid, forming a superconcentrated or "fuming" acid which is easily diluted to the required strength.

You may demonstrate this "contact" process in your kitchen laboratory, with the simple apparatus shown. Your sulphur dioxide producer is a tin-can cover on which you set fire to a mound of sulphur. The gas is collected by an inverted funnel held just high enough for air to come under its rim. Tubing carries the sulphur dioxide to the bottom of a pickle jar filled with lumps of calcium chloride which filter and dry it. For a catalyst, moisten a little asbestos fiber and shake it with a quarter

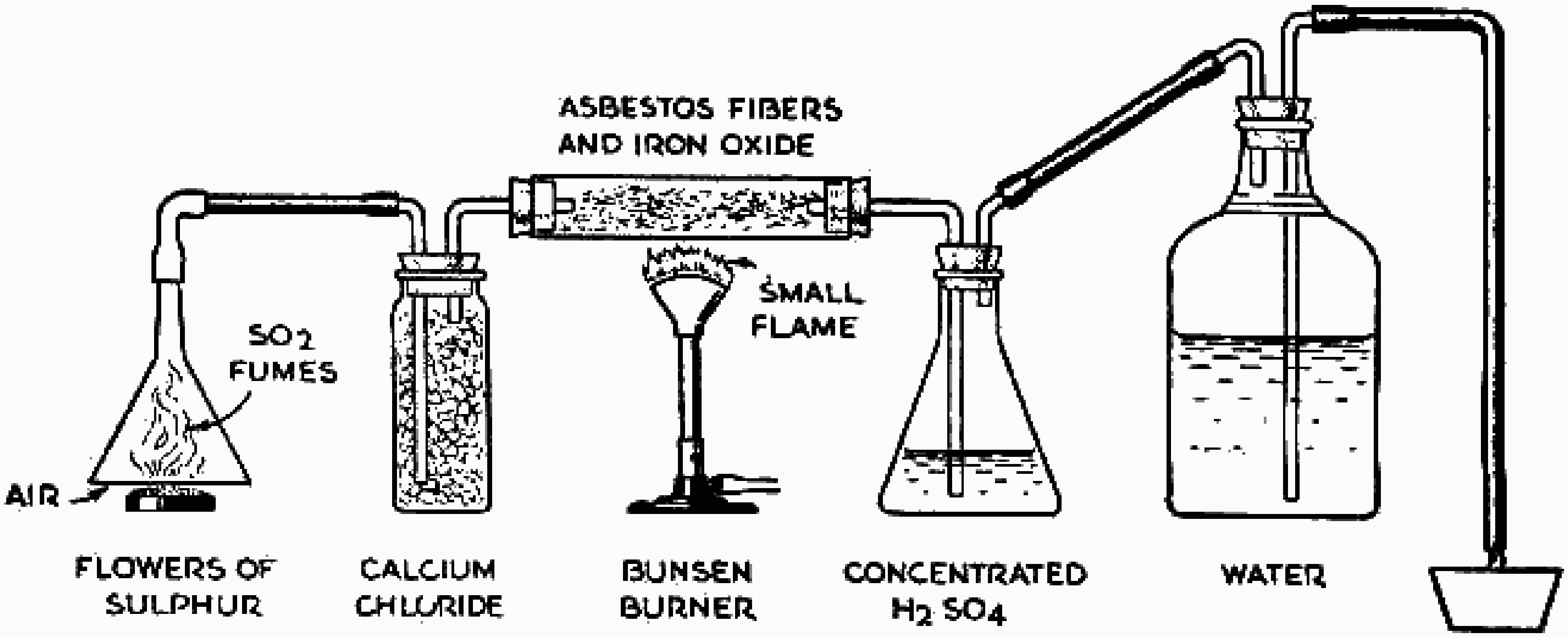
WARNING

Never pour water into concentrated sulphuric acid. They will boil and spatter over the room. This is caused by the acid's great affinity for water. The only safe way is to *pour the acid into the water,* stirring constantly. Likewise, concentrated sulphuric acid will draw water out of the skin, leaving a dangerous burn.

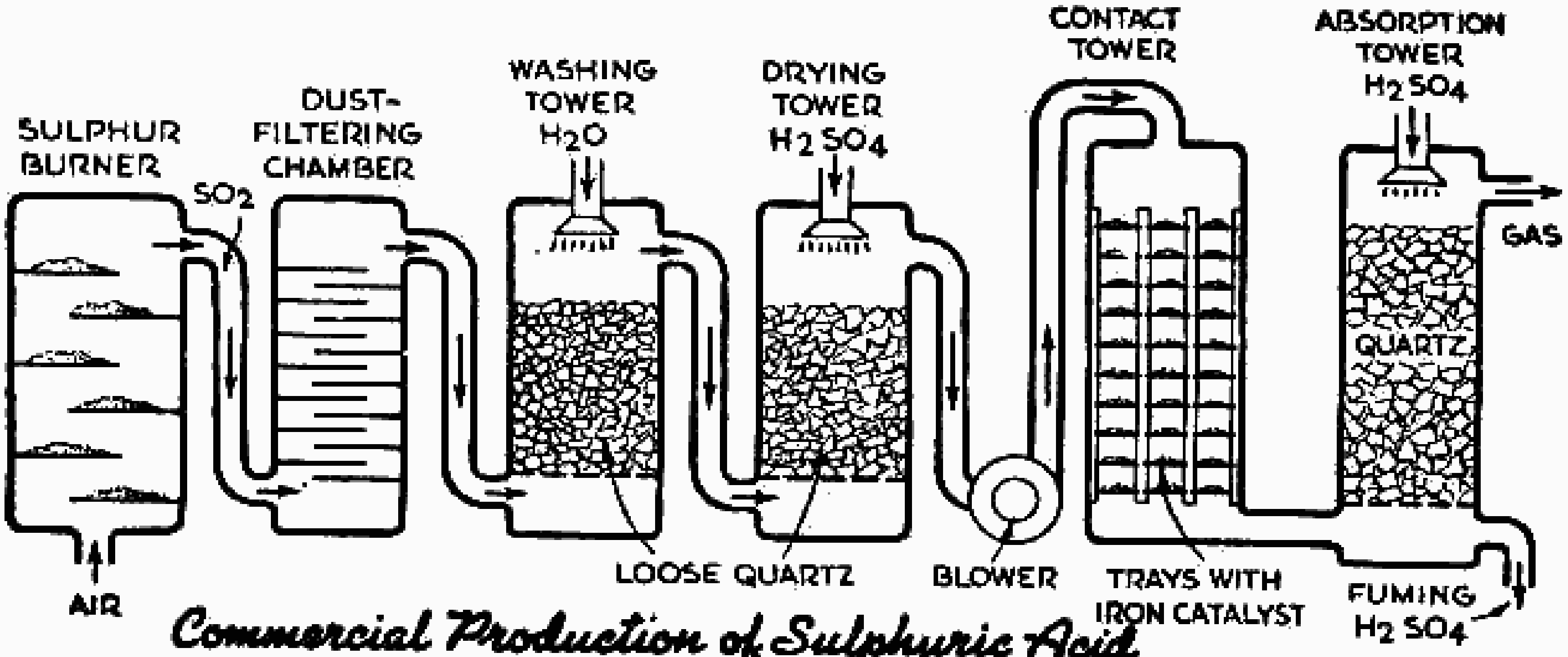
of its bulk of iron oxide. When thoroughly mixed, dry in an oven and pack loosely in the glass tube which is arranged horizontally in your setup. The remaining flask contains concentrated sulphuric acid. The half-gallon jar is a siphon bottle which draws the gas through.

The Bunsen burner must be adjusted for gentle heat or the sulphur trioxide will decompose again. A marked increase in the concentration of the sulphuric acid in the flask occurs in a few minutes. By adding it to water—in diluting, always *pour the acid into the water*—you get a greater quantity of acid of the original strength.

Sulphuric acid is used in making many other acids. As an example, nitric acid—tremendously important in manufacturing explosives and cellulose films—may be made in your home laboratory, but use a glass retort as nitric acid reacts on cork and rubber. Through a paper funnel, drop 25 grams of sodium nitrate into the retort. Carefully pour 20 cc. of concentrated sul-


ASBESTOS FIBERS AND IRON OXIDE
SO_2 FUMES
SMALL FLAME
AIR
FLOWERS OF SULPHUR
CALCIUM CHLORIDE
BUNSEN BURNER
CONCENTRATED H_2SO_4
WATER

Sulphuric acid can be made in your home laboratory with odds and ends like the apparatus shown in diagram above. Commercial manufacture by the "contact" process, illustrated schematically below, is essentially the same


SULPHUR BURNER
SO_2
DUST-FILTERING CHAMBER
WASHING TOWER H_2O
DRYING TOWER H_2SO_4
CONTACT TOWER
ABSORPTION TOWER H_2SO_4
GAS
QUARTZ
AIR
LOOSE QUARTZ
BLOWER
TRAYS WITH IRON CATALYST
FUMING H_2SO_4

Commercial Production of Sulphuric Acid phuric acid on the nitrate. Arrange the retort with its stem extending into a test tube immersed in ice water and its bowl resting on a square of wire gauze with an asbestos center. When the crystals are thoroughly moistened, heat the retort gently, distill at a low temperature until no more vapor condenses, and then allow to cool. The drops of liquid in the test tube will be pure nitric acid. HANDLE WITH CARE!

An important property of concentrated sulphuric acid is its eagerness to absorb water—a property employed to dry gases which are bubbled through and to remove water formed during chemical reactions. This dehydrating action can be demonstrated by dropping sulphuric acid on sugar. The mixture boils, then blackens and swells.

Dilute acid does not absorb water, however, and this may be shown by an amusing "stunt." Write with it on a piece of paper, and the writing will be invisible. Heat the paper, and the lines become visible as the water evaporates and the concentrated acid chars the paper.

Dilute sulphuric acid acts differently from concentrated in several ways, and, strangely enough, is often more active. Drop a little dilute acid on a piece of clean zinc or iron and it "attacks" the metal instantly, forming a sulphate and furiously releasing bubbles of hydrogen. Use cold concentrated acid and little or no action occurs. Heat the metal, and the concentrated acid will oxidize it and then form a sulphate.

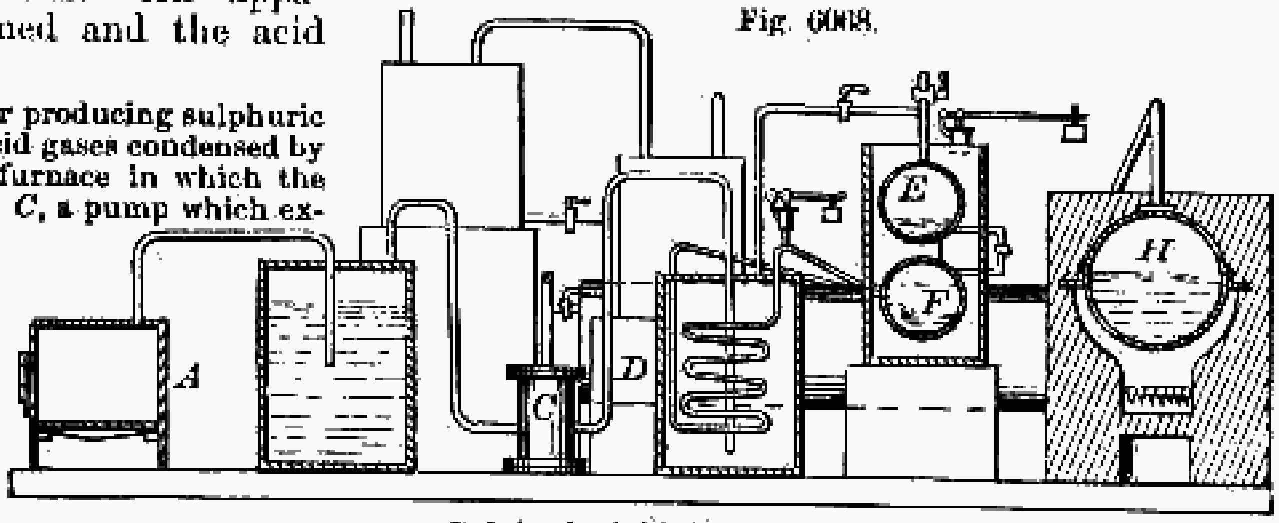
One of the greatest uses of sulphuric acid is in the production of fertilizers. In 1941, nearly a fourth of the total production was applied to this purpose. Phosphate rock, as found in the earth, is practically insoluble and of no use to plant life. Treatment with sulphuric acid changes it into soluble calcium phosphate, a valuable plant food. Two other important uses, in storage batteries and in electroplating, derive from its high electrical conductivity.

Shake a little sulphuric acid with an equal amount of castor oil or olive oil, and the result is a thick dark-reddish material called Turkey-red oil, which is used in the dyeing industry as a "wetting agent" to make dyes penetrate more evenly and easily. Having molecules which are partly attracted to water and partly to oil, it lowers the surface tension of water, spreads more readily.

Sul-phu'ric-ac'id Ap'pa-ra'tus. An apparatus in which sulphur is sublimed and the acid condensed.

Fig 6068 illustrates Tait's apparatus for producing sulphuric acid by means of sulphurous and nitric-acid gases condensed by pressure into the liquid form. *A* is a furnace in which the sulphur is burned. *B*, the first purifier; *C*, a pump which exhausts the gas from the first purifier, and forces it into the second purifier *D*, whence it is driven into the condenser *E*, where it is condensed into a liquid and drawn off into the cylinder *F*. The communication between *E* and *F* is then cut off, and a valve in the worm-pipe passing through the second purifier *D* is opened, relieving the pressure which maintains the sulphurous acid in liquid form, and permitting it to assume the gaseous condition. It flows through this pipe into a receiver, where the nitric-acid gas, oxygen, and steam from the boiler *H* are admit-

Fig. 6068.



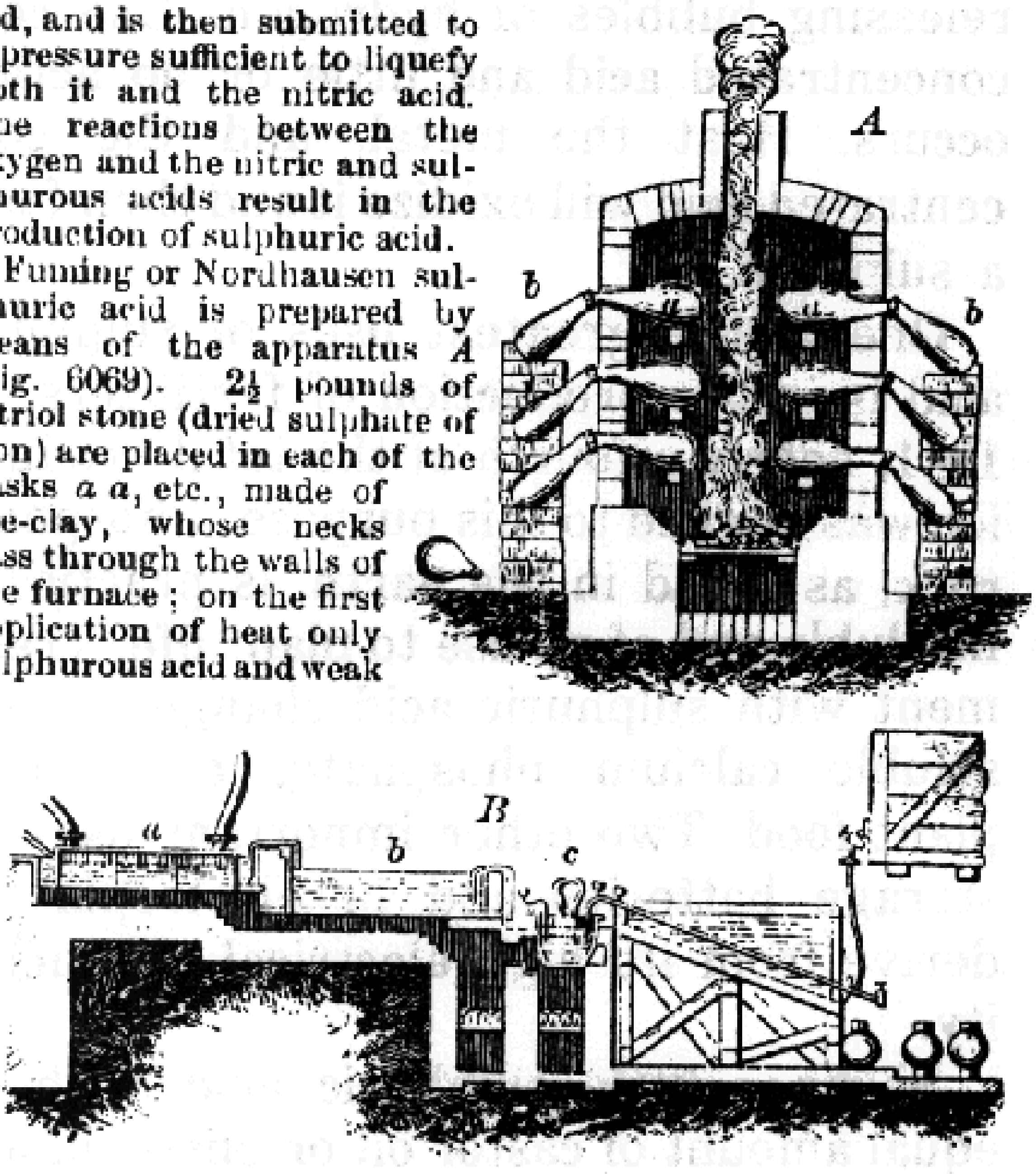
Sulphuric-Acid Apparatus.

ted, and is then submitted to a pressure sufficient to liquefy both it and the nitric acid. The reactions between the oxygen and the nitric and sulphurous acids result in the production of sulphuric acid.

Fuming or Nordhausen sulphuric acid is prepared by means of the apparatus *A* (Fig. 6069). 2½ pounds of vitriol stone (dried sulphate of iron) are placed in each of the flasks *a a*, etc., made of fire-clay, whose necks pass through the walls of the furnace; on the first application of heat only sulphurous acid and weak hydrated sulphuric acid pass over, which are usually allowed to escape. When white vapors of anhydrous sulphuric acid appear, the necks of the flasks are luted to the receivers *b b*, each of which contains 30 grammes water, and the distillation continued from 24 to 36 hours, when the flasks are again filled with the sulphate: this operation is repeated four times, before the acid is deemed sufficiently strong. Its specific gravity varies from 1.86 to 1.92 This variety is principally used for dissolving indigo; 1 part being mixed with 2 of the common acid for this purpose.

B is the apparatus employed for concentrating the ordinary sulphuric acid of commerce. The weak acid, prepared by the absorption in water of the gas evolved by calcining pyrites, is transferred to the leaden chamber *a*, connected by a siphon with the similar chamber *b*; the latter and the retort *c* are heated directly by furnaces, and the former by a flue therefrom; during the transference from the first to the second chamber the acid acquires a higher degree of concentration, and is then, by means of a second siphon, conveyed from thence into the retort, where water and weak acid are driven off, strong acid, of specific gravity 1.78 to 1.8 remaining in the retort, whence it is withdrawn by a platinum siphon of peculiar construction. The retort is also in many cases made of platinum, but glass is also frequently employed.

Fig. 6069.



Sulphuric-Acid Apparatus.

EXPLOSIVE - (RDX)

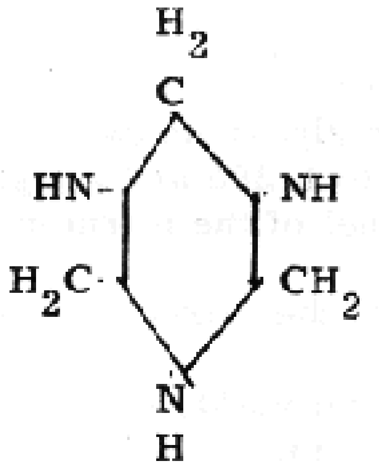
The well known nitro explosives used in practice belong both as regards their chemical constitution and also their properties and effects in general to two different groups, viz. the ethereal salts of nitric acid and the nitro compounds proper. Typical representatives of the first class are nitro glycerine and guncotton, of the second the aromatic nitro compounds such as trinitrotoluene, picric acid and tetranitromethylaniline. The most prominent features of the ethereal salts of nitric acid are on the favourable side the high amount of energy they contain and on the unfavourable side their easy liability to decomposition and their extraordinarily great sensitiveness towards mechanical influences. In contradistinction hereto is the behaviour of the aromatic nitro compounds. Their advantages are in particular their extraordinary chemical stability and their marked non-sensitiveness towards shock, but their disadvantage is their comparatively low energy.

These oppositely contracted properties explain the various attempts which have been made to provide an explosive, which shall combine in itself only the advantages of both classes of explosive, -that is to say a compound, which, in addition to the stability and non-sensitiveness of the aromatic nitro compounds exhibits the degree of energy of the ethereal salts of nitric acid. As a result of these attempts hitherto obtained, certain tetranitrated benzene derivatives with the only recently prepared tetranitraniline are the chief. These compounds are most certainly an advance in this direction, but they have not fulfilled the expectations demanded of them, because, as it was subsequently found, the increase in energy conferred by the fourth nitro group was obtained at the expense of a serious decrease in their stability. Owing to a decided liability of the fourth nitro group, which is situated in the meta position, these highly nitrated substances are so liable to decomposition, that any practical use thereof is not to be thought of.

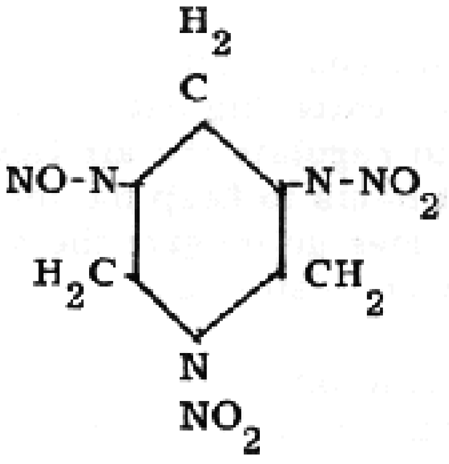
In this way therefore the end aimed at cannot be attained and there are consequently at present no prospects of the realization of this idea.

Now according to the present invention it has been found that hexamethylenetetramine, the well known condensation product obtained from formaldehyde and ammonia, yields, when suitably treated with concentrated nitric acid, an extraordinarily powerful explosive compound, which combines in itself in an absolutely ideal manner the favourable properties of the ethereal salts of nitric acid and the aromatic nitro compounds.

This new explosive substance is neither an ethereal salt of nitric acid nor a pure nitro compound, but is a nitramine with a peculiar ring formation. As chemical investigation has shown, it is derived like hexamethylenetetramine from the hypothetical cyclotrimethylenetriamine



and possesses the following structural formula:



This cyclotrimethylenetrinitramine is formed from all the accessible derivatives of cyclotrimethylenetriamine by the action of concentrated nitric acid. For its production on a large scale, however, only cyclotrimethylenetrimethyltriamine, that is the condensation product obtained from formaldehyde with methylamine could be entertained as a raw material in addition to the already known hexamethylenetetramine, as the other derivatives are difficultly accessible and therefore not economical.

The following method of preparation has been found to answer well by reason of its good yield and the remarkable uniformity of the product:

Into 500 grms. of nitric acid of a specific gravity of 1.52 freed as completely as possible from nitrous gases are introduced, at first in quite small portions, and gradually, 70 grms. of well dried crude hexamethylenetetramine with continuous stirring. The temperature is kept between 20° and 30° C. during the nitration. After the addition of the hexamethylenetetramine is complete the mixture is allowed to stand for a few minutes at the said temperature and then the mixture is slowly heated to 55° C. By continuous stirring and cooling if necessary the temperature is kept between 50° and 55° for a period of about 5 minutes after which the mass is again cooled down to the original temperature. After 15 minutes standing it is diluted whilst being again cooled by the quite gradual addition of from 3 to 4 times its volume of water and after some time the separated nitro compound is separated from the liquid. After being washed several times with cold water, hot dilute soda solution and again with water it is finally dried at any desired temperature. If necessary the product may also be recrystallized from acetone.

The cyclotrimethylenetrinitramine obtained in this way is a brilliantly white, odourless and tasteless rather coarsely crystalline powder of a neutral reaction. It melts at 200° C. and only detonates at higher temperatures. It is quite insoluble in water, difficultly soluble in hot alcohol more easily so in acetone glacial acetic acid and concentrated nitric acid from which substances it can also be recrystallized.

The cyclotrimethylenetrinitramine is not attacked by either boiling water nor by hot dilute acids and exhibits when subjected to the usual hot storage tests even at unusually high temperatures quite a remarkable stability. It is extraordinarily non-sensitive towards shock, blows and friction and in this respect is about equal to the aromatic trinitro compounds. When ignited it burns slowly without exploding with a bright reddish flame and a fizzing noise like tetranitraniline and leaves no residue.

The most surprising feature of this compound however is its extraordinary explosive and shattering power. In this respect the cyclotrimethylenetrinitramine exceeds all the explosive substances hitherto known, both the enormously energetic nitroglycerine and also the rapidly detonating tetranitraniline. This property it owes, in addition to a composition which permits of fairly complete internal combustion, to its high endothermic character principally. Whereas the formation of the most of the nitro explosives takes place with frequently a considerable loss of energy, the welding together of the cyclotrimethylenetrinitramine from the elements requires the astonishingly high amount of 81.4 calories per molecule. This latent fixed energy is again manifested on explosive decomposition and increases the amount of energy of this explosive to an unusually high amount. Hand in hand with this increase of energy there appears to be also the velocity of detonation which is greater than that of any other known explosive substance. Since there is added as a third factor an extremely large volume of gas due to the large amount of nitrogen and hydrogen contained, this new explosive seems to be of quite enormous effect, which is also clearly shown actually by the surprising results of the lead block and penetration tests.

Another requirement, which is demanded of a good explosive, that of a high density, is possessed by cyclotrimethylenetrinitramine in quite a remarkable degree. The absolute specific gravity is 1.82 and this is a maximum not possessed by any nitro compound hitherto. This fact enables very high loading densities to be obtained which is of great importance for many purposes, e.g., bursting charges for projectiles, detonators and percussion caps.

The following table will show the comparison of all these constants of explosive science with those of other explosives. (See next page)

A point of importance which is not to be underestimated is also the behaviour of cyclotrimethylenetrinitramine in a sanitary direction. In contradistinction to most of the other nitro compounds it is absolutely non-poisonous, has no tinctorial properties, is completely odourless and tasteless and does not cause either in the form of dust or solution any irritant affections of the respiratory organs and the skin. In juries to the work people by the usual discolourations of the skin, injurious action on the sense of taste, eruptions, headaches and easy chronic poisoning which are caused in the preparation and handling of the nitro compounds are therefore precluded and the complicated hygienic precautions hitherto necessary become partially superfluous.

From these remarks it will therefore be clear, that in cyclotrimethylenetrinitramine we have a perfectly new, hitherto unknown explosive, which combines in itself in an ideal way the advantages both of the ethereal salts of nitric acid and also those of the aromatic nitro compounds, combined with remarkable stability and non-sensitiveness while it surpasses all hitherto known and practically usable explosives in energy, shattering power and density and combines with these extraordinary properties in an explosive respect many advantages also as regards sanitary conditions.

Its possibilities of use embrace in respect of the large number of excellent properties which it possesses, all branches of civil and military explosive science. In addition to its use for bursting charges for projectiles, mines, and the like, and as a blasting agent for all mining and mineralogical purposes it is particularly suitable for the production of extraordinarily rapidly acting detonating fuses and in conjunction with initial means of ignition for the filling of percussion caps, detonators and fuses for projectiles. According to the use for which it is required and the effect aimed at the cyclotrimethylenetrinitramine may be used alone, or in conjunction with or mixed with other explosives or components of explosives.

NITROGLYCERIN

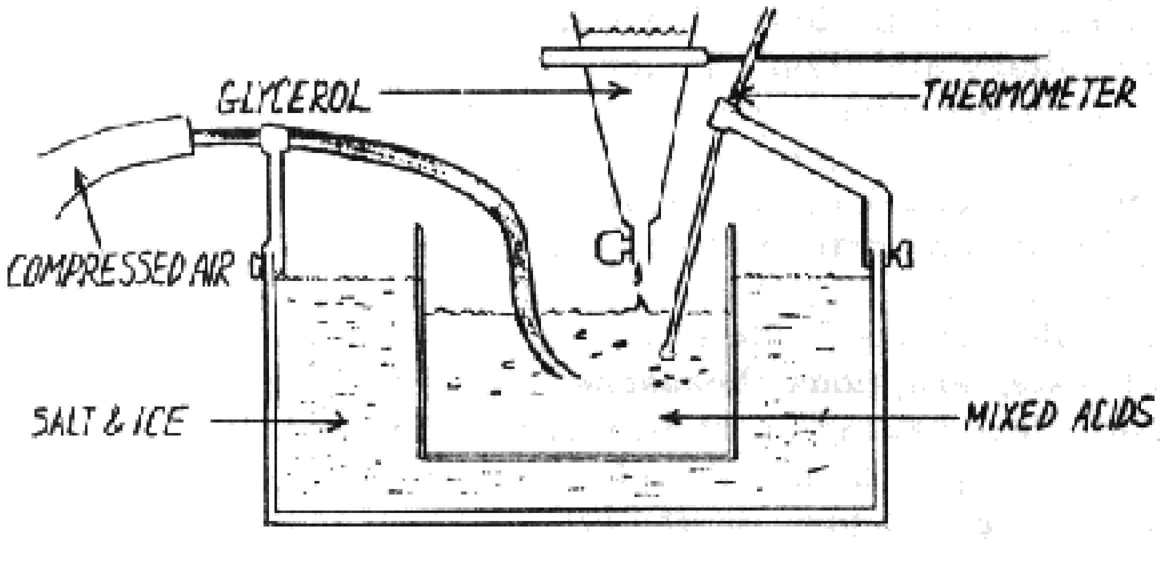
Basically, the production of nitroglycerin involves the gradual adding of glycerol to a mixture of nitric and sulfuric acids followed by separation of the nitroglycerin from the waste products. The following directions will serve for the laboratory preparation of nitroglycerin in small amounts.

PREPARATION OF THE MIXED ACID:

(1) Measure out 200 ml. of fuming, or 90% Nitric acid having a specific gravity of 1.5 at room temperature.

(2) Measure out 300 ml. of concentrated, or 98% sulfuric acids, having a specific gravity of 1.84 at room temperature.

(3) Slowly pour the Sulfuric acid into the Nitric acid, and start letting it cool off in the salt-ice bath.



ACTUAL NITRATION:

(1) Measure out 1 unit (oz., mo., gram, etc.) of chemical pure glycerol, or glycerine (water free) having a specific gravity of 1.262 to 1.265 at 15 degrees centigrade, into the dropping funnel of the nitrator.

(2) Put 6 like units of the mixed acid into the nitrator tank.

(3) One unit of glycerol yields about 2-1/3 units of nitro so you can judge the amount of glycerol to use by the amount of nitro you wish to make.

(4) The nitrator can be made of glass, cast iron, lead, or steel.

(5) Start the air flow and regulate it so that the acids are well stirred but not spattering out of the nitrator. Use a screw type clamp to regulate the air flow, and watch the flow carefully as it helps to keep the temperature down. If the temperature does go up give the nitrator as much air as you possibly and safely can.

(6) Start the glycerine into the nitrator in a fine, slow stream or even by the drop, depending on the temperature rise, and the speed and violence of the reaction. With plenty of time available the drop method is advisable.

(7) The ice bath is salt and crushed ice and small amount of water.

(8) Use a total immersion centigrade thermometer in the acids in the nitrator. The nitrating temperature is kept below 22 degrees centigrade. If it runs higher, cool it off. The temperature can go up 30 degrees C. without too much danger. The nitro being produced will start to decompose at 50 degrees C. and give off the red gas of nitrogen dioxide, which is poisonous. Don't let this happen. If there is a sudden rise in the temperature or the red gas is noticed, DUMP THE WHOLE WORKS INTO THE COLD WATER!

(9) Keep the reaction cool, and the air stirring going until the temperature of the reaction comes down to 15 degrees C and remains there or a little cooler.

SEPARATION AND WASHING:

(1) Pour the cool solution from the nitrator into plenty of room temperature water. Now run this water-nitro-acid solution in the separator.

(2) Separate the "liquors" or waste acids from the nitro. The nitro will be heavy oil on the bottom.

(3) Keep the "liquors" separate for further separation with chloroform, if one wants to do this. This is only done AFTER neutralizing the acids with sodium carbonate solution. Check the acidity with blue litmus paper. When it is neutral, the litmus will stay blue and show NO red.

(4) Add plenty of 38 to 43 degree C water to the nitro and mix up with the air stirring. Then separate.

(5) Repeat the washing completely as above.

(6) Wash with a warm, 4% solution of sodium carbonate.

(7) Wash with water 3 more times as in step #4.

(8) Give it a final wash of concentrated salt solution, let it set for one day before separating.

(9) Separate and check the nitro for acidity. The nitro must be neutral. If it is not, keep washing it. It MUST be neutral due to safety and keeping qualities.

DRYING:

Dry the nitro over sulfuric acid in a dessicator. The nitro should have a specific gravity of 1.6 at 15 degrees C. It may take several days for the nitro to dry out.

CHLOROFORM SEPARATION:

Add an equal quantity of C. P. Chloroform to the NEUTRAL "liquors." Mix, then let separate and run through the separator. Let the chloroform-nitro set in the open for 1 day so the chloroform can evaporate off as much as possible. Now this nitro can be mixed with the other nitro just before put into the dessicator to dry.

CAUTIONS

(1) DON'T TOUCH ANY 2 GLASSES TOGETHER WHEN POURING AS THE NITRO MAY RUN DOWN THE OUTSIDE OF THE GLASS THEREBY CREATING DANGER.

(2) THE ENTIRE OPERATION SHOULD BE DONE IN THE OUTSIDE OR A WELL VENTILATED PLACE OR UNDER A HOOD OR DUCT.

(3) NITRO IS POISONOUS AND THE FUMES CAUSE SEVERE HEADACHES.

NOTES

(1) THE WARMER THE NITRO IS THE MORE SENSITIVE IT IS TO DETONATION.

(2) FROZEN NITRO CAN'T BE DETONATED, THEREFORE, IT IS SAFE.

(3) THE PROCESS TAKES ABOUT 2-1/2 HOURS EXCLUSIVE OF THE SPECIFIC PROCESSES REQUIRING SEVERAL DAYS.

(4) NITRO IN ITS LIQUID FORM HAS 30 to 60 TIMES THE EXPLOSIVE POWER OF NITRO WHEN IT HAS BEEN ABSORBED IN A DYNAMITE FORM.

THE PROPERTIES AND PREPARATION OF PROPYLEEN GLYCOL DINITRATE (PGDN)

Properties: Nitroglycerine (NG) is the most common liquid high explosive known today. However, there are many other similar liquid nitric esters which have the same explosive properties as NG. Many of these have somewhat inferior blasting power to that of NG (a few are superior) but are more stable towards mechanical shock than NG itself. PGDN is just one such compound, being at least ten times more stable towards mechanical shock than NG. Under the falling weight test, NG detonates at a height of from two to four centimeters using a two kilogram weight. PGDN fails to detonate under the same weight dropped from a heighth of 100 centimeters. It fails to detonate under a 10 kilogram weight from a height of 20 centimeters. This difference becomes valuable in manufacturing and transportation.

Another property of PGDN which recommends it for serious consideration by any organization is its stability toward storage over long periods of time without suffering any decomposition. Further, PGDN does not freeze as readily as NG, thereby eliminating the hazards of partially frozen NG which is most dangerous to handle. PGDN freezes at minus 20 degrees centigrade, or minus four degrees F. This means that stocks of PGDN can be buried in underground caches without serious danger of freezing, provided they are placed below the frost-line. At the other end of the temperature scale, PGDN shows extreme stability. It shows no decomposition after 25 days at 75 degrees Centigrade. Unlike NG, it does not cause the severe headaches from breathing its vapor. Like NG, it can gelatinize guncotton thereby suggesting its use for the manufacture of cordite and smokeless powder-like substances.

As an explosive, PGDN shows about 90% of the expansion of NG in the Trauzl lead block test. By calculation, its energy content is 77% of that of NG. It is a highly brisant explosive however, and has a detonation rate of over 7,000 meters per second. Despite its high mechanical insensitivity to shock, PGDN is easily initiated by a detonation wave. It can be set off with a number 6 blasting cap.

Propylene Glycol is somewhat cheaper than Glycerine at the present time by about 20¢ a pound in lots of 40 lbs. PG can be purchased from any chemical supply house for about 60¢ to 75¢ per lb. depending on the quantity bought. Furthermore, the nitration of PG requires less of the mixed Nitric-Sulfuric acids. These savings of course are offset by the lower explosive power of PGDN, and may well balance out when all economic computations have been made. Nevertheless, the greater stability of PGDN toward mechanical shock and the lower freezing point far outweigh any other considerations. For this reason, all those who have been manufacturing NG, or who have been considering doing so, should give serious thought to the manufacture of PGDN instead. The process is basically the same, uses the same type of mixed acids, the same procedure for separation and purification and can be run in the same equipment used for NG.

The following procedure was carried out by the writer of this report for the preparation of PGDN during a recent experiment. Although the preparation was conducted on a very small scale, there is absolutely no reason why larger batches cannot be made, provided they are kept within realistic bounds. Batches ten times the size of the one described on the following pages would be reasonable, and would produce approximately 180 grams of PGDN (i. e. 6-1/2 ozs. b/w).

Preparation of Propylene Glycol Dinitrate: 30 grams of 96% Sulfuric Acid was slowly poured with stirring into 20 grams of 90% Nitric Acid. A small amount of heat was produced, but it is not excessive, and no external cooling is required. The 50 grams of mixed acid thusly produced has a composition of approximately 36% Nitric Acid, 57% Sulfuric Acid, and 7% water. It has a specific gravity of 1.71 at 25 degrees C., and occupies a volume of 30 milliliters.

The entire 50 grams of mixed acid was placed in a 100 ml glass beaker which in turn was placed in a bath of ice and water. The acid was stirred by hand, using a thermometer. When the temperature of the mixed acid had sunk to 10% C., 10 grams of Propylene Glycol (9.6 ml) was introduced dropwise with good stirring. The rate of addition of the PG was so regulated to keep the temperature of the mixture between 10 and 15 degrees C. The addition of the PG takes from 20 to 30 minutes, depending on the efficiency of the cooling bath, and the rate of stirring. No red fumes were observed at any time during the addition. The PG should be dropped directly into the acids and not be allowed to splash on the side walls of the beaker or on the stirring rod. Droplets that do so, can start to oxidize and generate heat creating a hazard. PG is more sensitive to oxidation than Glycerine itself, and so a lower nitration temperature is necessary. Nitrations at 20 degrees C. begin to show some oxidation, and at 30 deg. C. the reaction begins to go out of control! IMPORTANT: A large vat of ice water should always be kept near at hand when doing any nitrations. If the temperature begins to climb rapidly and passes the upper limit given for the specific nitration, the entire batch should be dumped IMMEDIATELY into the vat of ice water. The vat should contain at least five times the volume of water and ice as there is liquid in the nitrator. Sudden rises in temperature accompanied by red fumes or brown smoke is an indication that oxidation is taking place, and that the batch is about to go out of control. After the PG has all been added, stirring is continued for another five to ten min. It is then ready for separation.

The mixture is poured into a separatory funnel and allowed to stand for a few minutes. A sharp line of division will appear when the mixture has separated. The lower acid layer of spent acids is carefully withdrawn and set aside for further purification before being discarded. The upper layer of PGDN is left in the funnel and an equal volume of cold water added to it. The funnel is closed, and gently shaken for about a minute. On standing, the mixture divides into two layers as before, but this time the product (PGDN) is the lower layer. It is drawn of into a clean beaker, and the water wash layer, which remains in the funnel, is poured out of the top of the funnel into another vessel. This washing process is repeated two or three more times, each portion of used wash water being added to the previous one. The product is then given a wash with dilute Sodium Carbonate solution until the solution remains alkaline to Litmus paper, the spent Carbonate wash(es) being added to the used water washes. Finally, the PGDN is washed with water again until it is no longer alkaline. When drawn off from the final wash, the PGDN will be somewhat milky in appearance due to occluded water. On standing in a warm room for several hours, this water will evaporate, leaving a colorless oil having a pleasant ethereal odor. 18 grams of product were obtained in the above run.

Before pouring away, the spent acids should be extracted with chloroform to remove traces of PGDN. The same portion of Chloroform can then be used to extract any traces of PGDN in the water and Carbonate washes. After the Chloroform evaporates a further amount of PGDN will be obtained. The chloroform solution should be washed until it is neutral to litmus before evaporation, however. The spent acid, after extraction with the Chloroform, should be poured into a large volume of water before being discarded. All glassware which has come into contact with PGDN must be rinsed with Acetone before soap and water cleaning. These Acetone rinses should be poured over sawdust and ignited at a safe distance from the point of operation. Rinse the nitration beaker with water first before rinsing with Acetone. Nitric Acid ignites Acetone!

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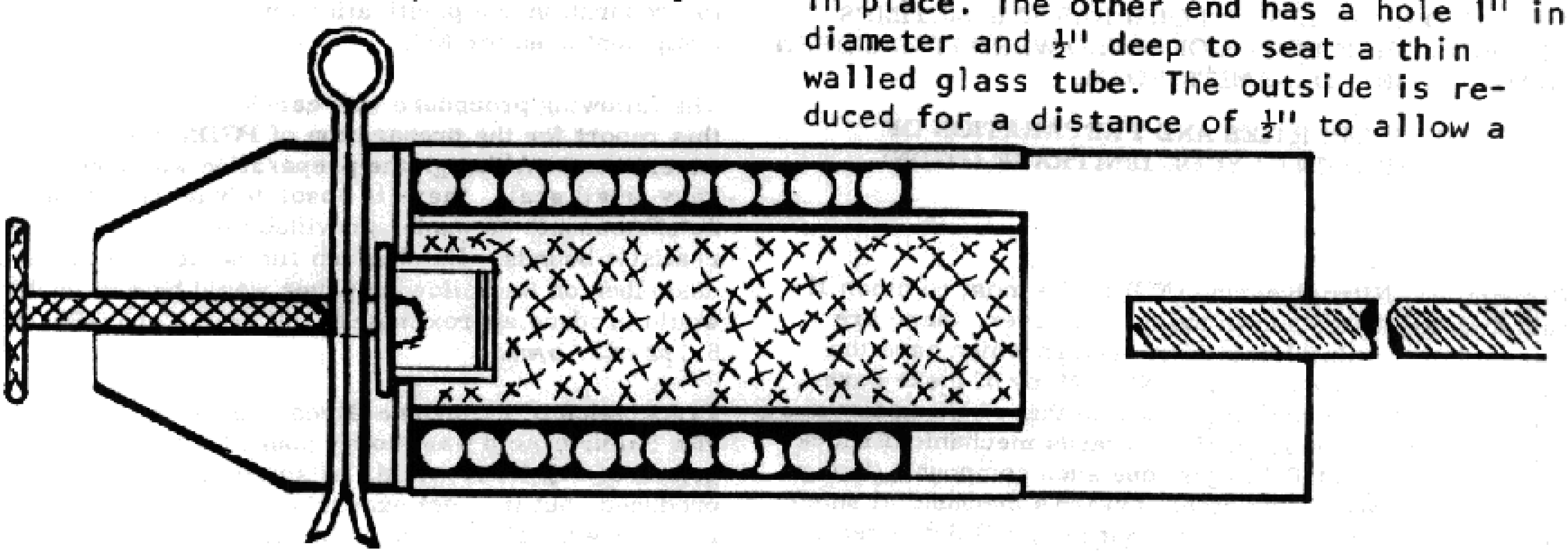
arrow launched grenade

By Raymond J. Larner

This grenade can be used with; a conventional long bow, a compound bow, or a crossbow, which would be my first choice.

The nose and tail caps are cast using either plaster of paris or clear casting plastic.

The tail cap has a hole drilled in it to accept an arrow shaft or a cross bow bolt. The shaft or bolt should be glued in place. The other end has a hole 1" in diameter and ½" deep to seat a thin walled glass tube. The outside is reduced for a distance of ½" to allow a



piece of thin walled metal or plastic tubing to be slipped over it.

The nose cap is cast with two holes through it, (or you can cast it solid and then drill the necessary holes) to take a firing pin and a cotter pin safety. It also has a recess in the bottom to sit over the base of a .410 shotgun shell base.

The initiator is the brass base from a .410 shotgun shell. Carefully cut the shell apart just above the brass base, after first having emptied out the shot, powder and wadding. Once you have the brass base cut down, refill most of it with the powder you removed before cutting it. Use tissue paper or a thin cardboard wad to hold the powder in the brass base.

A steel washer with an outside diameter of 1½'' is used to support the shotgun shell brass base. Drill out the center of the washer to accept the brass base. The rim of the brass base should be supported by the steel washer.

The outside casing for the grenade is a piece of thin walled metal or plastic tubing.

The center tube is a piece of thin walled glass tubing that has an outside diameter of 1''.

To assemble the grenade:

1. Insert the shotgun shell base into the steel washer.
2. Epoxy the washer to the bottom of the nose cap.
3. Epoxy the glass tube to the steel washer.
4. Epoxy the outer casing to the steel washer.
5. Fill the space between the glass tube and the outer casing with B.B.'s, small nuts and bolts or nails.
6. Fill the glass tube with black powder, rifle powder or one of the propellant powders listed in the Improvised Munitions Handbook in PMJB Vol. 2.
7. Epoxy the base cap to the glass tube and outer casing.
8. Install a cotter pin with non-hardening Permatex and slip it in place until it is sitting on the safety pin.
10. Epoxy the complete grenade to the end of an arrow or bolt.

DANGER NOTE: Make sure the hole for the firing pin is a snug fit. If it is too large, the Permatex may not hold the firing pin in place when you launch it, possibly causing the grenade to explode in your face when you fire it.

The firing pin is a piece of steel rod 1/8'' in diameter with a 3/4'' OD washer epoxyed or soldered to the end. Make sure the firing pin extends far enough past the end of the nose cap so that it will hit the shotgun shell primer when you hit your target.

Remember that this grenade has to hit something fairly solid to be set off. If shot into sand or mud, it may or may not explode. It would probably be set off if it hit a human or animal, but only if there was plenty of force pushing it.

Make sure that your arrow is long enough for you to come to full draw without having the grenade hit the bow.

Improvised Hand Grenades

by

Dan Moore

A ready supply of improvised hand grenades can be made in the home workshop at a cost of about 75¢ apiece. These grenades are easy to make and are just as effective as regular grenades. There are two kinds, offensive and defensive, in which both use the same fuse assembly. Additionally, these grenades use readily available materials and can be put together in 15 minutes.

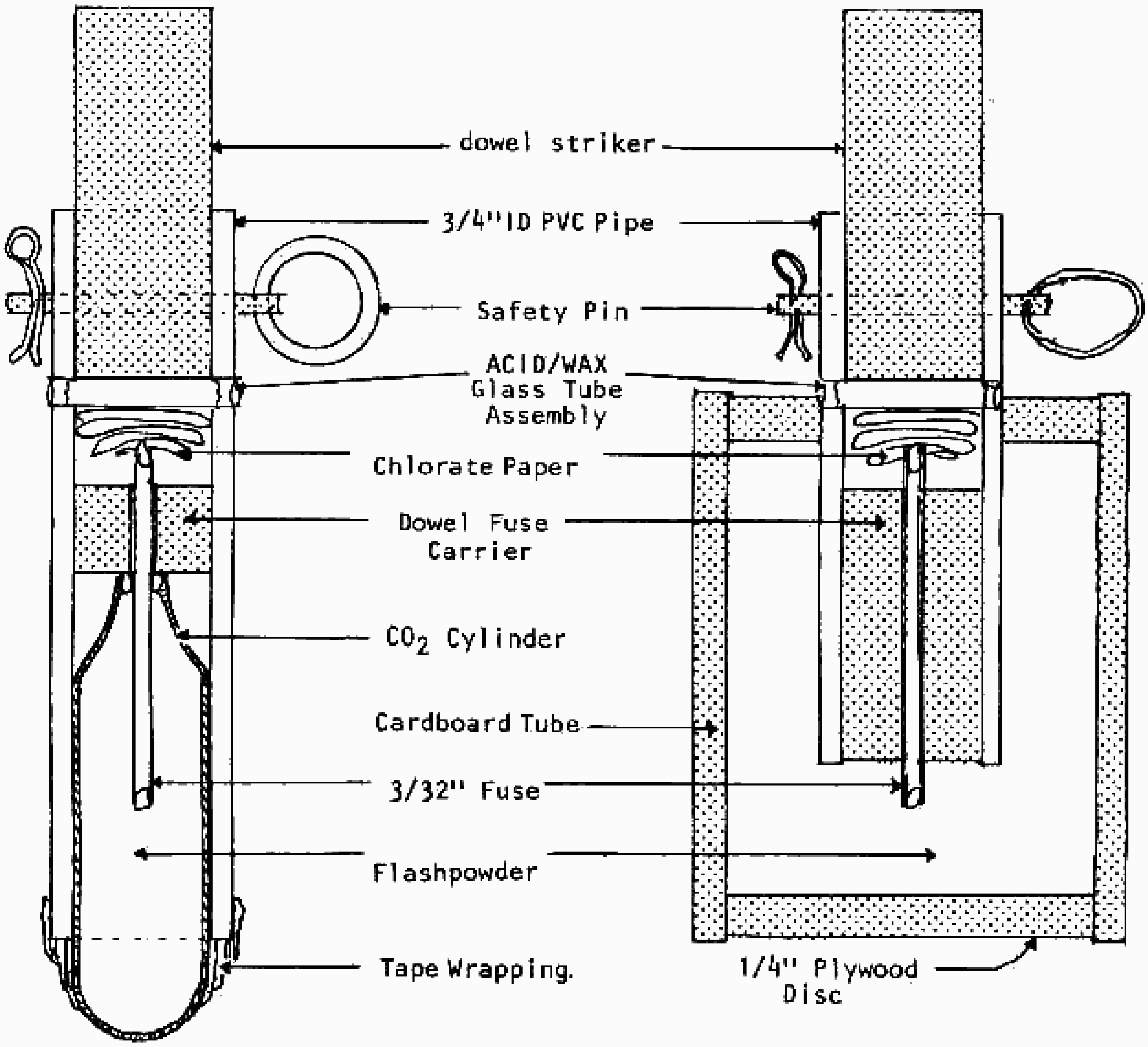
The heart of these grenades is the fuse assembly, therefore I will describe its production first. The materials needed for the fuse assembly are:

1. 3/4'' PVC pipe in 4'' lengths
2. 3/4'' wooden dowel in 2'' lengths
3. 5 mm glass tubing
4. 1/8'' wooden dowel in 1½'' lengths,
5. Paraffin wax
6. Concentrated sulfuric acid
7. 50% sodium chlorate and 50% sugar mixture made pasty with water then blotted on paper towels and dried.

A. Construction of fuse assembly

Start construction of the 'fuse' by drilling a 3/16" hole 1" from an end of the PVC pipe. This hole will hold an acid vial. Next insert a length of 5 mm glass tubing into this hole and place the 3/4" wooden dowel into the PVC pipe so it is touching the glass tubing. Drill a 1/8" hole 1/2" from the dowel end of the pipe. This 1/8" hole is where the safety pin is inserted (see diagram). The safety pin is the 1½" length of 1/8" dowel (a hole can be drilled in an end of the dowel and wire inserted to aid in pin removal). With the 1/8" hole drilled insert the safety pin. This will hold the 3/4" dowel in place (see diagram). The length of glass tubing can be removed. The installation of the chemical ignitor remains.

Construction of the chemical ignitor is started by making the acid filled vial. Make this vial by cutting a length of 5 mm glass tubing the same length as the O.D. of the PVC pipe. Next seal one end of the tube with 1/8" of paraffin by dipping it in melted wax. Now fill the tube with sulfuric acid using a glass eyedropper, etc., leaving a 1/8" air space. Fill this space with wax. The vial can now be inserted into the PVC pipe and taped in place. Finish the 'fuse' by inserting a 2" x 2" square of chlorate paper next to the acid vial (see diagram). The fuse assembly is finished.


dowel striker
3/4"ID PVC Pipe
Safety Pin
ACID/WAX Glass Tube Assembly
Chlorate Paper
Dowel Fuse Carrier
CO_2 Cylinder
Cardboard Tube
3/32" Fuse
Flashpowder
Tape Wrapping.
1/4" Plywood Disc

B. Construction of offensive (concussion) grenade

The materials needed for the offensive grenade are:

1. 2" heavy-walled cardboard tube in 3" lengths
2. two plywood plugs for the above
3. epoxy or glue

4. Flashpowder
5. 3/4" dowel in 1½" lengths
6. 2" length of safety 'fuse'
7. the 'fuse' assembly

Start construction of the grenade by drilling a 3/32" hole through the center of the 3/4" dowel. Then epoxy the fuse into this hole leaving ¼"exposed on either end. Now place a small amount of chlorate paper on one fuse end to insure it ignites (see diagram). Next cut 1" off the open end of the 'fuse' assembly and epoxy the dowel (chlorate paper end first) into it. The chlorate paper on the dowel fuse should contact the chlorate paper in the fuse assembly (see diagram). Continue by cutting a hole the same diameter as the 'fuse' in the center of one of the plywood plugs. Epoxy the fuse assembly into this hole leaving 1" of the dowel end protruding out.Now epoxy this plug into the cardboard tube with the dowel end of the 'fuse' out. Fill the cardboard tube with flashpowder and epoxy the solid plug onto the other end of the tube (see diagram). The grenade is finished.

C. Construction of defensive(fragmentation) grenade

The materials needed for the defensive grenade are:

1. empty CO_2 cartridge
2. 3/4" wooden dowel in ½" lengths
3. epoxy or glue
4. safety fuse in 2" lengths
5. flashpowder
6. fuse assembly

Start construction by drilling a 3/32" hole through the 3/4" dowel. Insert the safety fuse through the dowel allowing ¼" on one end and 1¼" on the other. Epoxy the fuse in place. Now fill the CO_2 cartridge with flashpowder and insert the 1¼" fuse end into it. Use tape, etc.to secure the fuse. Wrap a small amount of chlorate paper around the short fuse end (see diagram). Place the dowel and CO_2 cartridge (chlorate paper end first) into the fuse assembly as before. Be sure to epoxy the dowel into place. Finsih by taping the CO_2 cartridge into the fuse assembly (see diagram). The grenade is finsihed.

D. Firing procedure and miscellaneous

The firing procedure for these grenades is as follows. First,grasp the grenade in your hand with the dowel end up. Second, pull the safety pin out. This arms the grenade. Third,strike the dowel end sharply against the palm of your hand, etc. There should be a 'hissing' sound and a small amount of smoke should come from the dowel end. This indicates that the chemical igniter has functioned. Finally hurl the grenade at your target immediately and take cover. The grenade should explode in five (5) seconds.

You now know all you need to make and use my grenades, however, there are a few additional items. I will list these for convenience.

1. Use the offensive grenade to daze and stun the enemy and use the defensive grenade to inflict casualties.
2. 2" PVC pipe can be used as a fragmentation sleeve for the offensive grenade.
3. Grooves,etc. can be filed into the CO_2 cartridge or fragmentation sleeve for better fragmentation.
4. Wax placed around the striker makes an effective air and water seal, while a coat of varnish on the grenade will make it waterproof.
5. Offensive grenades can be used for smoke or incendiary purposes by replacing the flashpowder with the appropriate filler.
6. Both grenades make effective landmines when buried exposing only the dowel. Sheet wood can be placed on top of the dowel for increased surface area.
7. Survivalists, etc. wishing to store these grenades should remove the acid vials and store them separately.
8. Chemicals and equipment for my grenades can be purchased from Merrel Scientific; address: Educational Modules Inc.,1665 Buffalo Rd.,Rochester,NY 14624. Catalog $1. Merrel has a good line of chemicals and labware with fast delivery. High melting point wax, glass tubing and glass tubing cutters can also be purchased from Merrel.
9. High melting point wax or acid proof —epoxy can be used to more effectively seal acid vials. Use this for grenades to be stored.
10. Check PMA Vol.1 #1 for additional grenade information.

Precautions:

11.Make and use several test samples before increasing charge size.

12.Test safety fuse in fuse assembly to make sure it will not jet after being epoxied in place. If it does, try another brand or epoxy the fuse at the dowel ends only.

13.Wait at least two minutes when approaching dud grenades.

Provided these items are considered and the instructions followed anyone should be able to safely make and use these grenades.

FLASHPOWDER

Potassium Chlorate is a highly unstable and dangerous compound when used in a pyrotechnical mixture which also contains sulfur. Combined, these two compounds are sensitive to both heat and friction as well as sparks, and are made more so by moisture absorbed from the humidity in the air. Furthermore, they deteriorate on storage slowly producing sulfuric acid which makes the mixture even more unstable.

Some years back I had the unfortunate personal experience of having just such a mixture spontaneously ignite while I was mixing it on a hot humid day. Had the amount of materials been larger or had I been a bit less lucky, I would have been permanently blinded.Even so, I suffered painful burns to my eyes, face and hands.

Sader, but wiser, I looked for a mixture of equal power, but with better storage qualities and one less hazardous to prepare.

The answer I found involved the use of potassium perchlorate. Although this chemical contains more oxygen than the clorate, it is more stable in both storage and preparation. In addition, I found the sulfur could be eliminated entirely, making the preparation that much simpler.

The ingredients are, by weight, 7 parts potassium perchlorate and 5 parts aluminum powder. Both should be as fine as possible. After weighing they are thoroughly mixed and stored in a sealed container until needed.

This mixture is extremely powerful and very,very fast burning. Well made,with very fine ingredients, it burns about 3-4 times faster than commercially made black powder. It is excellent for use in aerial bombs, large or small firecrackers or any purpose where a quick violent explosion is needed. It is too rapid burning for use in any firearm, and is not suited to such use.

I have kept such a mixture several years with no deterioration, however reasonable storage precautions should be observed.All such mixture type powders, including commercially prepared black powder, should be protected from dampness. All will deteriorate if exposed to large amounts of humid air, but if you use common sense, they will keep indefinitely.

There are also several other mixtures that I have experimented with and found satisfactory. While I do not think any of them are quite as good as that already given, they are noteworthy because they involve the use of other ingredients of the first formula.

Alternative No.1

Bariam Nitrate	4 Parts
Sulfur	1 Part
Aluminum Powder	2 Parts

Alternative No.2

Potassium Perchlorate	12 Parts
Sulfur	8 Parts
Fine Sawdust	1 Part

Alternative No.1 is probably better than No.2 which does not seem to keep as well as the others. However, number 2 makes a very violent explosion. Furthermore it is the only really good formula I have ever seen for flash powder which does not require aluminum powder.

These mixtures, particularly the perchlorate-aluminum powder one, will burn and if confined, explode almost no matter how badly they are mismeasured or poorly prepared. Like most things though, the end result is reflective of the care put into production. The most important thing is to have the ingredients as fine as possible before mixing them together. There is not much you can do about the aluminum except to get the finest powder possible. The potassium perchlorate can be gently ground in a mortar and pestle or by other suitable means if necessary. The goal is to have the texture as near to that of flour as possible. If you have the consistency of table salt, it will work, but not as good.

The second thing is that the ingredients be thoroughly and intimately mixed. If you achieve the desired degree of fineness in the ingredients, the mixing is not very hard,but it must be thorough. Mixing is most easily accomplished with a flat wood stick on several layers of newspaper.Sifting through a small screen, as fine a screen as may be obtained, several times is very useful. It should be done after a preliminary mixing and not only mixes the ingredients but sorts out any large pieces which can then be broken up. Avoid the use of metal and ceramic utensils because of spark and contamination hazards.

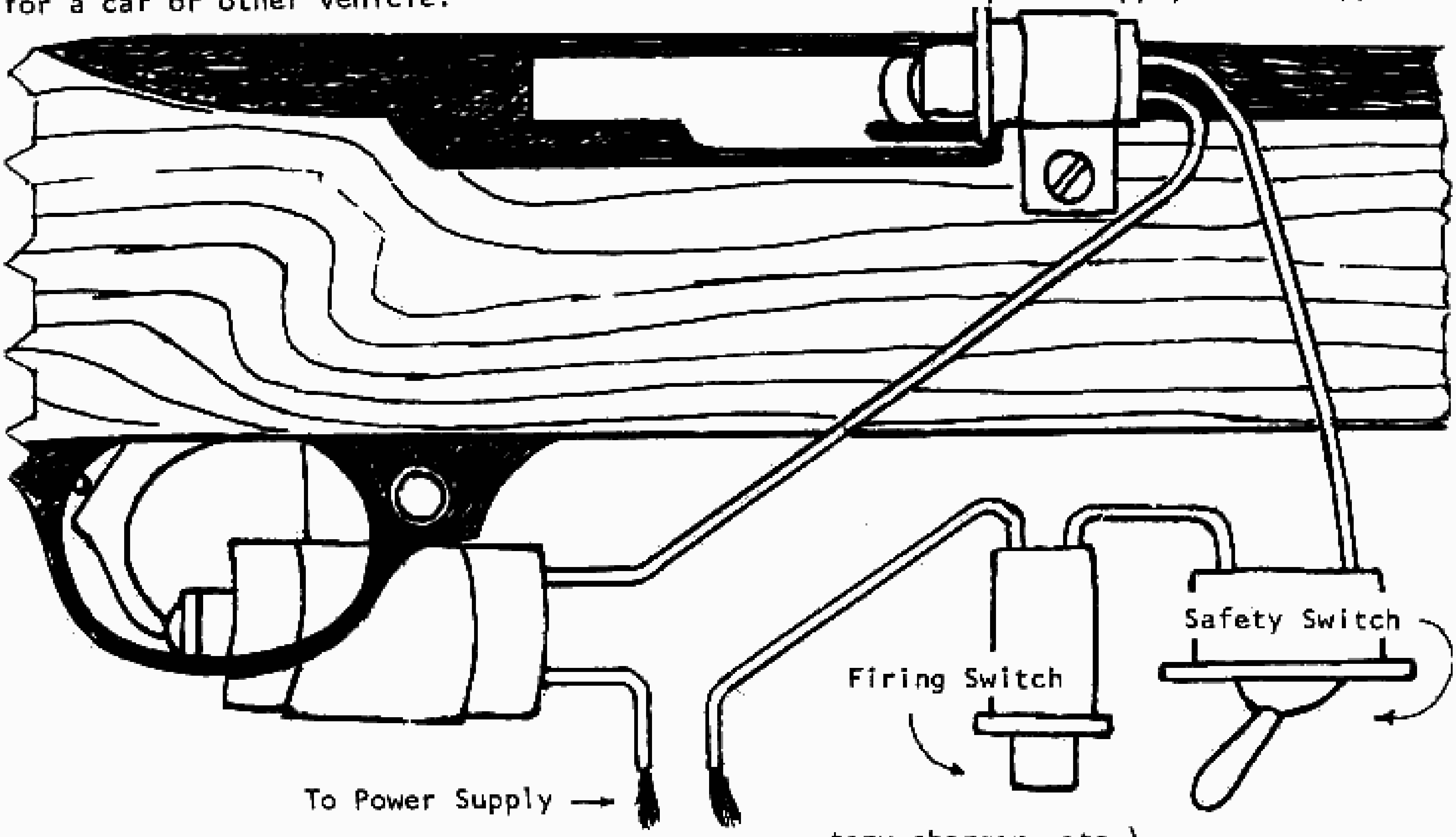
With a little practice, it is easy to judge the quality of such powder by placing a small quantity on a fire resistant surface in an open area and lighting it with a short piece of fuse. Good quality powder will burn almost instantly with an intensly bright flash, and a puff of white smoke.

If made with reasonable care, any of these powders are equal to that usually found in commercially manufactured firecrackers such as M-80's.

ELECTRIC RIFLE

THE KENTUCKY RIFLEMAN

By following the instructions below you can modify any semi-automatic rifle or shotgun to fire fully automatic and by remote control as a bonus! It's great for a car or other vehicle.



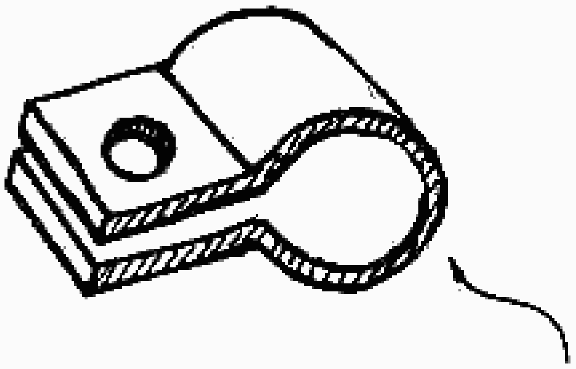
You will need the following parts:

- One 12 volt solenoid.(I used the carburetor solenoid from a Ford van)
- One toggle switch for 12 volts.(Auto supply store or junkyard)
- Two push button switches /normally off. (Auto supply)
- Steel strapping or other light metal pieces for mounting. (Hardware store)
- Misc. wire / does not have to be very heavy.
- One semi-auto weapon. (I used a Ruger 10-22, but others will work)
- A 12 volt power supply. (battery, battery charger, etc.)

Please refer to the drawings when building your system.

1. Start by making mounts for the push

button switches and the solenoid from the steel strapping. The exact design will depend on the switches and solenoid you use. These mounts must be stout enough to hold the parts on the gun in the correct position.

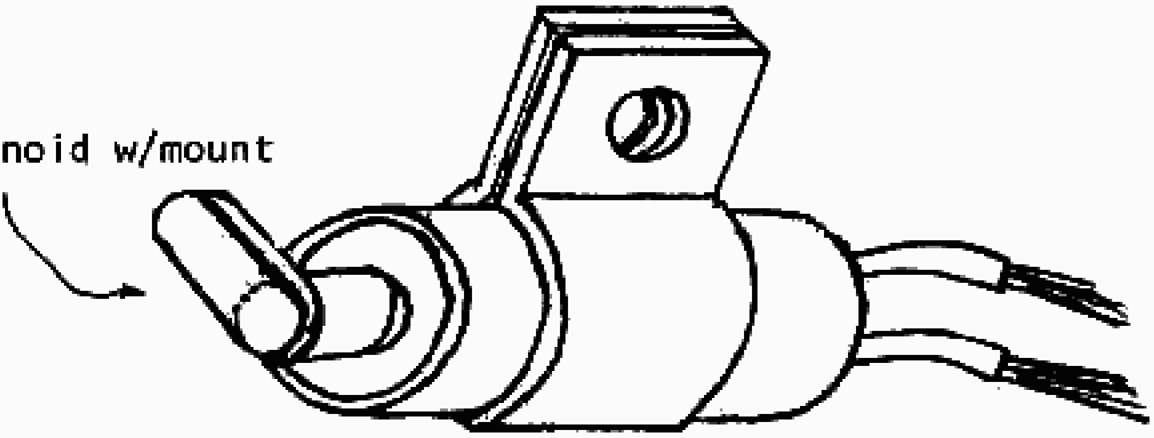


Switch and solenoid mount

2. The first push button switch must be mounted so that the operating lever of the rifle will push it as the action closes.
3. The solenoid has a metal extension screwed, welded or brazed to the plunger so it will push the trigger when it is activated. The modified unit is now mounted to the trigger guard assembly.
4. The toggle switch and second push switch are the controls and are mounted at your fire control center. In the drawing I show them just under the rifle, but they can be whatever distance you want (such as on the dash of the car).
5. To wire, just follow the pictures, making sure you get the switches in series.

When the wiring is completed, the toggle switch acts as a safety (it must be on for the gun to fire) and when the firing button is pressed, the solenoid will trip the trigger, causing the rifle to fire. When the operating handle goes forward, it presses the switch mounted at the front of the receiver, which causes the solenoid to again trip the trigger. This continues as long as the firing switch is held down or until the ammo runs out.

Solenoid w/mount



This system can be used to secure an approach to your property, such as a driveway or a ditch. You can also mount the system on a T.V. rotor and be able to change the aim. If the gun is mounted in a car or truck, be sure it is very solidly fixed and give close attention to aiming and consider the effect of the car moving.

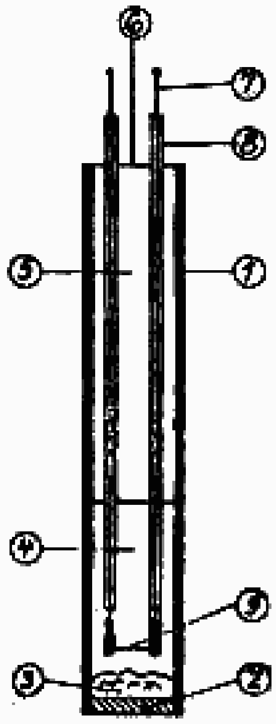
Now you can even fire two weapons in two different directions at once!

IMPROVISED ELECTRIC BLASTING CAPS

How to nitrate mercury:

1. Take a bottle with 1000 cm^3 concentrated, pure nitric acid (spec.weight 1,42). Pour 120 gramms pure mercury into the acid and let it rest for 12 hours. Don't put a stopper on the bottle. After 12 hours put a stopper on it and turn it (acid and mercury shall mix). After some time take the stopper away, because there might be some fumes. Then close the bottle again.

2. Take a big bottle with a large opening with 1280 grams of 95% (pure) alcohol. Pour the mixture of nitric acid and mercury in this bottle. Don't close it. After a short time toxic fumes will escape. When this stops the nitrated mercury will lay on the bottom of the bottle. It must be washed with distilled water and dried in the sun on a glass plate.



1. copperpipe
2. end (soldered)
3. cotton wool
4. mercury, must be nitrated (Knallquecksilber)
5. cotton wool
6. tape
7. electric contacts
8. insulation
9. thin wire (like that in a bulb)

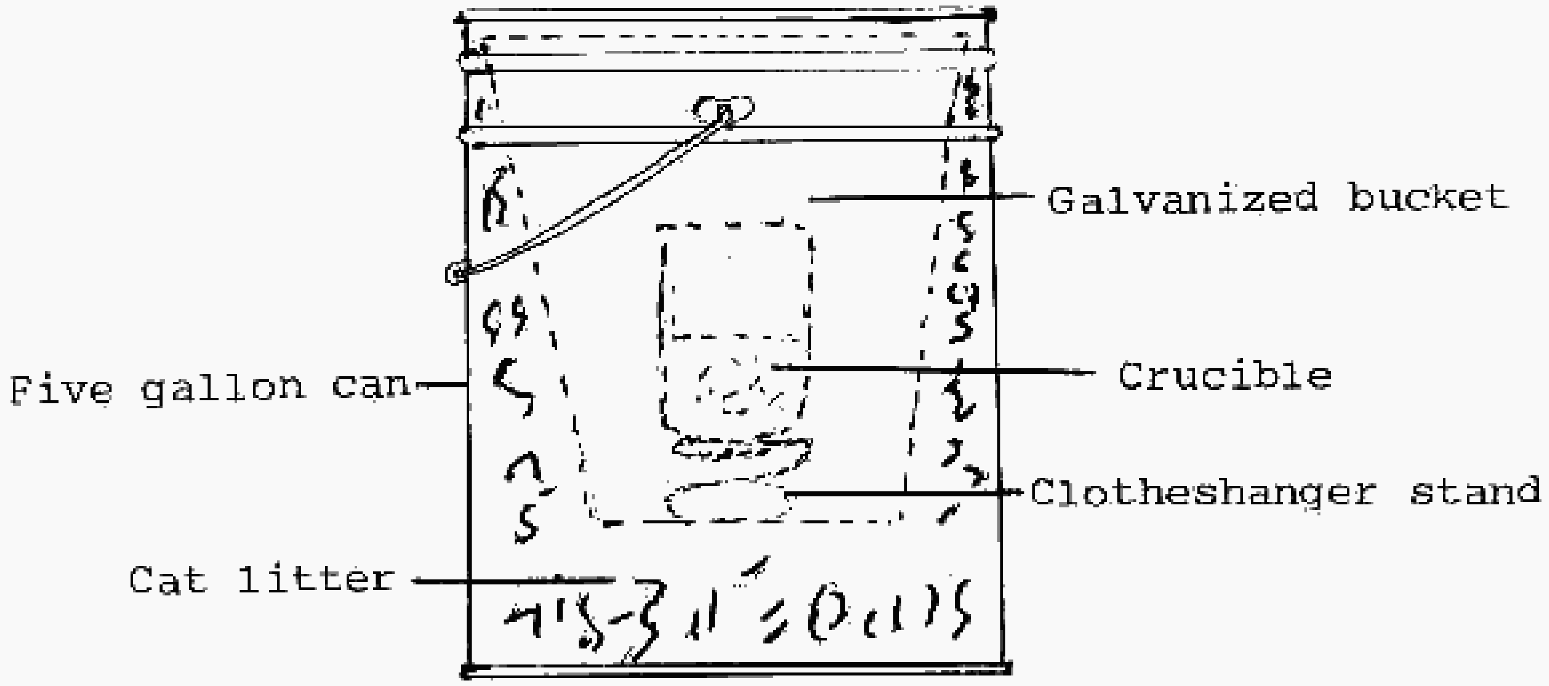
POTASSIUM CYANIDE

In order to make potassium cyanide you must first learn how to make both potassium carbonate and potassium ferrocyanide. If you have some background in chemistry, and especially access to a lab and its equipment, the following processes may at least give you a laugh. And if you're one who believes laypersons should not have access to methods for making such substances, this section should give you the screaming meemies and cold sweats. Because this junkyard lab I'm going to describe really works. If you are the type who likes to fantasize functioning under a totalitarian system which treats everyone like he was either a prison or or a nuthouse inmate, you'll love this.

What with the stigma placed on potassium cyanide by a veritable handful of jerks, it is just about unattainable now. Even though it is not even a controlled substance at this time, I challenge you to get some. I fully expect home chemists to manufacture potassium cyanide and sell it on New York street corners like they do Crack.

At any rate, if you are imaginative and like to learn weird things, turning out your own potassium cyanide will give you a feeling of real importance. It will also teach you more about chemical manipulations than you will learn about in most schools.

These processes may seem time consuming and complicated. However, they are actually very simple. Little time is actually spent, as most of the processes will be working while you are otherwise occupied.



FURNACE

THIS FURNACE, ALONG WITH A HAIR DRYER, ALSO MAKES AN EXCELLENT FORGE FOR METAL WORKING. ITS USE AS A FORGE WOULD ALSO BE AN EXCUSE FOR IT.

With potassium ferrocyanide you can also make prussic acid. To my knowledge, that's the deadliest poison a kitchen chemist can make. Instructions for making it are elsewhere in this book. Its use was demonstrated in the movie, "The Final Option". A terrorist girl was riding a bus in the seat just in front of the intended victim. She had the prussic acid in a perfume atomizer, which can be bought in any department store. Pretending to primp while looking into a hand mirror, she caught his eye and gave him a quick spray in the face, holding her breath in the meantime. One whiff and before he could react he crumpled and died.

Getting back to potassium cyanide; knowledge of how it works might give you the incentive for learning to make it. It acts directly on the nervous system, rapidly. It stops the use of oxygen by the tissue cells and paralyzes the center of the brain which controls the breathing muscles. A fatal dose of cyanide involves about 50 milligrams, about the weight of a postage stamp. Yet this dosage contains close to 10 billion, billion molecules. One molecule of cyanide can disrupt the function of one body cell. A lethal dose, then, affects one out of ten cells in the average human body. Cyanide kills by turning off an enzyme the cell needs to use oxygen from the blood. This enzyme, cytochrome, is vital to the cell's utilization of oxygen. Shut down the action of up to ten percent of a body's cells and death is almost immediate.

Buying potassium cyanide these days is nearly impossible, due to the actions of a few psychotics. These psychotics in our body politic might be compared to cyanide, itself. Whereas just a tiny amount of cyanide is enough to cut off the body's supply of air, a comparable amount of dingbats in a social system is enough to cut off the supply of a chemical once available to all and sold over the counter without questions.

Digressing to a little social comment, I believe society would do better to rid itself of its crazies rather than institutionalizing all of us with bans on guns, chemicals and whatever the psychotic might use next against society. Since looneys have taken to using the telephone to call in threats of tampering and poisoning, we might find soon that our phone privileges are in jeopardy.

At the end of this section are excerpts from 19th century books which describe the making of the chemicals in this section. Modern books guard against such descriptions for reasons of public safety. Of course, in the last century, those who were a threat to public safety were gotten rid of in the interests of the freedom of anyone to have or do whatever he wanted as long as he didn't act to the disadvantage of others. I put the older material here to show how simple these compounds are to make and how casually such knowledge was disiminated among a responsible populace.

Potassium carbonate is gotten from wood ashes. It is the same stuff your great grandmother used to make her lye soap. It is obtained by boiling ashes, letting the ashes settle, pouring off the liquid and evaporating it. It is further refined by heating to over 800 degrees F or more in a furnace, which you can make.

There are several steps to making the grade you need but you can do so with common utensils and little real knowledge of chemistry. The fun of making your own is a feeling of accomplishment and also of security if you like to fantasize getting away with something without anyone knowing.

HOTPLATE

You can do all this work on your kitchen stove but when boilovers occur there is too much screaming and yelling to make your projects worthwhile. Also, there may be times when fumes would be smelly or even dangerous and a hotplate will allow you to run an extension cord outside in the garage or on the back porch.

The kind of hotplate you need is one with a gradual heat control as opposed with one with a single setting or three settings, low, medium and high with nothing in between.

FIVE GALLON CANS

Round, five gallon cans are fine to boil your ashes in and are part of the furnace and have many other uses. Such cans used to be plentiful but since most companies now use plastic the metal ones are hard to find. I called all the places I expected to have them but had no luck until I called my friendly Exxon gas station. Gas stations get grease for lube jobs in the metal cans and give them away. You have but to ask.

They are the very devil to clean as the grease still in them doesn't melt. You can wipe them clean with newspapers and finish with old rags.

ASHES

Wood or coal ashes are both suitable for extracting potassium carbonate from. Coal is simply wood which is maybe fifty million years old. Charcoal ashes are in the same category as wood or coal ashes. You can figure extracting about one pound of potassium carbonate from ten pounds of ashes.

If you have a fireplace or furnace, ashes are no problem. Otherwise, you might ask someone to let you remove their ashes. You will not be refused. Of course, you could always go to some vacant lot, pile up a lot of scrap wood and burn it. Ashes should be no problem.

FIRST STEP

First, put three gallons of hot tap water in one of the cans and put the lid on it. It should boil pretty soon if you put the hotplate dial on full heat. Then the dry ashes, which you have run through a piece of window screen, are put in while stirring. Put in the ashes a pound or so at a time so the heat is kept at a simmer. When the ashes are all in and simmering away, put on the lid and leave it alone for about a half hour. Then remove the lid and stir some more to keep the ashes from lumping on the bottom. Do this every half hour for about three hours, turn off the heat and let the ashes settle overnight.

You should have at least three five gallon cans. Take an old shirt or other cloth and cover the top of the second can. Then wind a turn or so of picture hanging wire or heavy cord around the outer lip of the can, tightly. Then pour off the yellow liquid from the ashes, slowly. When you get to the loose sediment continue pouring. When you get to the heavier sediment, stop, as most of the potassium carbonate has already gone over and what is left is not worth more effort.

Let the loose sediment alone for an hour or so until most of the liquid has gone through the cloth. Then scoop out the sediment from the sagging cloth and remove the cloth.

You should have at least two gallons of yellowish liquid in the can. Put the can on the hotplate and turn it on to full heat. Leave the lid off so the water evaporates. When you have only a couple of quarts left it is time for the first filtering.

FILTERING

Get a coffee filter holder from any supermarket along with a good supply of filters. You can get generic filters for about $1.50 for 200. Put the filter holder and filter on top of a quart jar and slowly pour the liquid from the can into the filter. When the filter gets slightly clogged and you are tired of holding the can, stop, wait for the liquid to go through the first filter and then dispose of the dirty filter.

Pour the filtered liquid into a stew pot or something similar and renew the filter and fill the jar again. Dispose of that filter and continue until there is no liquid or sediment in the can.

Put the pot on the hotplate and set it at a simmer. Watch it pretty closely so all the liquid doesn't evaporate, letting the crude potassium carbonate stick to the pot. When you see crystals forming, that is the time you watch closely because you'll just have to put in more water if it sticks. When it is a mush, put it in the crucible and let it heat until all the moisture is out.

CRUCIBLES

The salts must be melted to fuse and react with the compounds which creates the cyanides. This takes heat at well over 1000 degrees F. The melted salts will go through most clay crucibles and the great heat will melt the seams of most tin cans. You could go to a welding shop and have a four inch wide by six inch long length of steel pipe cut and have a one eigth inch thick steel bottom welded on. This would make an excellent crucible but it would cost maybe five dollars or a little more. If you don't care to pay anything, go to your nearest gas station and get the used oil filters which are thrown away. The largest and most common filters are five inches deep by nearly four inches wide. Their value lies in the fact that they are steel and seamless and free. All you have to do is take a hacksaw and cut around the lip of the filter. Make sure you don't dent the filter or it won't come off. Wipe the oil from it and you will have an excellent crucible which will last through several firings. The larger sizes are best but you may have use for the two smaller sizes. At any rate, the few minutes it takes to cut the case off are well worth the effort.

FIRST FIRING

After the crude potassium carbonate has been well dried in the crucible on the hotplate, it must be fired in the furnace to remove most of the impurities. Never fill the crucible more than half since it tends to bubble up and some would be lost. Since the first firing is while the crucible is completely covered with charcoal or briquets, you must provide the crucible with some sort of cover. If you don't have a jar lid the right size, just cut a circle of tin from a can and cut slices around it so the edges can be bent over, forming an adaquate cover. It doesn't have to fit tightly since it is simply to keep ashes out of the potassium carbonate.

THE FURNACE

A furnace which will serve every purpose in making potassium cyanide can be made with one of the five gallon cans, a galvanized bucket and a 20 pound bag of cat litter. You can get the bucket from any hardware store for under five dollars.

First, pour enough cat litter in the can so the bucket is about an inch from the top of the can. Next, put a piece of thin cardboard between the bucket and the can and pour litter on the cardboard so it fills the space between the bucket and the can. Now you have a furnace which will hold great heat and also will not burn anything outside it. Of course, if your back porch is wooden, set the furnace on a couple of bricks. You can't be too safe.

In your furnace you will also need something to hold the crucible above the first layer of the charcoal briquettes as they don't burn well with the crucible sitting directly on them. This is no problem as you can make a simple stand for the crucible with a clothes hanger. Just bend the clothes hanger around so the the ends nearly touch. Then bend the hook over toward the ends. Put the stand in the bottom of the bucket and sit the crucible on the hook. Bend the stand this way and that until you have it so the crucible will stand straight and about an inch above the bottom layer of briquettes.

Charcoal briquettes are better than regular charcoal because they burn more evenly and last longer. They also throw out less sparks when you are using a hair dryer for white heat. Whatever sparks might blow out are not really dangerous, as they go out within seconds, but you don't want to attract a lot of attention, especially if you are working on a back porch in a city.

The best place to use your furnace is in a garage with the door open so you get plenty of air. Under no circumstances must you use the furnace inside. The carbon monoxide would make you quite ill, if not dead.

Charcoal briquettes are sold at all supermarkets for about $3.00 for 20 pounds. Charcoal lighter is also easily available but I find that a Bernz-O-Matic propane torch with pushbutton lighter to be far superior. You can light the charcoal even faster by simply putting the nozzle of the propane torch down between the briquettes for about a minute. I would suggest you get the bottom layer going, pile in the rest of the briquettes and light them. In a little while, all the briquettes will catch fire and the whole bunch should be glowing with no smoke.

On your first firing of the crude potassium carbonate, pile briquettes in a heap over the covered crucible. Let it burn all night and when you uncover the crucible the next day you'll have what appears to be a mass of fused carbon. If the crucible is still hot, and it probably will be, set it in a pan of water to cool it. If you pour water in it while it is still hot steam and ash will erupt and probably burn your hand.

When the crucible is cool, fill it with water and let it set for a few hours before digging out the contents. This will give the water enough time to dissolve a lot of the purer potassium carbonate hidden in the carbon. When the caked mass can be dumped out of the crucible, put it in two quarts of water and mash and stir it so the potassium carbonate dissolves completely.

Set the two quarts of matter aside until the carbon settles. Then pour the clearer liquid into the filter over the jar. Empty the clear liquid into the pot and set it to simmering so it will evaporate. Here is where you will use up several filters. The liquid goes through very quickly when the filter isn't clogged. Also, a lot of the carbon will go through the filter at first. And when you are to the bottom of the matter and there is mainly carbon left, that will take longest to filter. At any rate, it will all come through clear after a few filterings so don't expect perfect clarity at first. So as a filter empties and what goes through isn't clear, pour it back through another filter and keep it up until it is clear, then evaporate it in the pot.

POTASSIUM FERROCYANIDE

When you have the pretty pure potassium carbonate filtered to clarity and evaporated to a mush, put it in a tin can and put it on the hotplate at medium heat until dry. Since it will stick to the can, take a hammer and bang the can on the sides and bottom to break it loose. It's just a tin can so go ahead and ruin it.

When you have the potassium carbonate out and in chunks, pulverize it to a powder. It will not be crystalized since heating it in the tin can has burned out the water of crystalization. I'm telling you this because when you read the old formulas they tell of crystals and I don't want you to think you have made a mistake. Crystalization is a process manufacturers are set up for but which you don't need.

All right; so you now have some pretty pure anhydrous (without water of crystalization) potassium carbonate. Now for the potassium ferrocyanide. Read the old articles and formulas at the end of this article. Dicks, for instance calls for potassium bicarbonate, to be re-purified to make absolutely pure potassium carbonate. But such purity is for the reagent grade used by chemists for testing and whatever. You don't need 100% pure potassium carbonate or potassium ferrocyanide or even potassium cyanide to anneal with or leach gold from quartz or self-destruct capsules or cyanide grenades or even prussic acid. Read the formula for potassium cyanide from the Techno-Chemical Receipt Book, 1896 to see the garbage which can be used for what you want. You know that wouldn't pass any chemist's test for purity but 400 milligrams of that would make an enemy go belly-up, just the same.

Some of the old formulas call for iron turnings, some call for ferrous oxide (iron oxide or just plain rust). The point is that fused, the atoms of iron will be picked up by the potassium carbonate whether iron turnings or rust is used. Also, you can go to any junk yard and scrape off a lot of rust from old boilers, car bodies or whatever, with a lot less trouble than it takes to turn iron. Use whichever is handy.

Again, some of the old formulas call for coke, cinders or coal, charcoal, blood, hair or leather to add more carbon to the potassium carbonate. So just use five parts of whichever you want. I would choose charcoal but you could get scrap leather from any shoe shop, chop it in small bits and stir it in. The parts referred to mean parts by weight.

So let's get down to the business of making potassium ferrocyanide. Take 10 parts of your homemade potassium carbonate, 10 parts of charcoal or bits of leather and five parts of iron turnings or rust. Get the furnace set up with the bottom layer of charcoal briquettes lit then put the crucible on the coathanger stand. Then pile briquettes all around the crucible and get the rest of them lit. Next, take a regular hair dryer and set it for cool and play the air on the briquettes. You don't want to set the hair dryer on hot since its heat would be negligible but would burn out the unit in a short time. Besides, all you want is the air flow and the dryer can be used indefinately when set on cool. So now you have the briquettes lighted and are training the air flow all over them. You'd be surprized at the difference in heat.

When the crucible turns white hot, pour in the well-mixed ingredients and keep the heat playing around the crucible. I would advise the wearing of glasses and gloves while making potassium ferrocyanide.

Soon the contents will begin to redden and fuse. Take a bent out coathanger wire and stir occasionally. After all flames have ceased in the crucible use a pair of tongs or pliars and lift out the crucible. When the contents have cooled, pour them into two quarts of water and treat as you did while filtering the final processed potassium carbonate. You may want to crystalize it as described in Dick's process further on in number 4201.

POTASSIUM CYANIDE

The last part is a snap. Divide what potassium ferrocyanide you have into eight parts and add three parts by weight of your potassium carbonate. Get your crucible white hot again and pour the mixture in. Very soon it will melt and you will see some slag in the bottom of the crucible. Waiting until all bubbling, simmering or whatever ceases, lift out the crucible and pour the liquid portion into an iron frying pan or onto any hard, cold surface which will not be affected by a molten substance. This will be a pretty pure grade of potassium cyanide. It will not stick and should be broken up and put in an airtight jar. You can get some more potassium cyanide by dissolving and filtering the slag and evaporating the liquid. That's all there is to making potassium cyanide.

DICK'S ENCYCLOPEDIA OF FORMULAS & PROCESSES 1872

4181. Carbonate of Potassa. This is also known under the name *Salt of Tartar*, and *Salt of Wormwood*. The crude carbonate is obtained by lixiviating (*see No.* 23) wood ashes, evaporating the solution to dryness, and fusing in iron pots for several hours. This constitutes the *potash* of commerce.

Another method of preparation is to transfer the product of the first evaporation to an oven or furnace so constructed that the flame is made to play over the alkaline mass, kept constantly stirred with an iron rod. The ignition is continued until the impurities are burned out, and the mass becomes of a bluish-white; this is commercial *pearlash*. The U. S. Pharmacopœia directs, for general purposes, the impure carbonate to be dissolved in water, filtered, and evaporated until it thickens, and then granulated in the manner directed for the pure carbonate.

4182. Pure Carbonate of Potassa. Put 12 troy ounces bicarbonate of potassa, in coarse powder, into a large iron crucible; heat gradually until the water of crystallization is driven off, then raise the heat to redness and maintain it at that heat for 30 minutes. When cool, dissolve it in distilled water, filter, and evaporate over a gentle fire until it thickens, then remove it from the fire and stir it constantly with an iron spatula until it granulates. (*U. S. Ph.*)

4201. Ferrocyanide of Potassium. This *yellow prussiate of potash* is the *prussiate of potash* of commerce. It is obtained by exposing 10 parts potash or pearlash; 10 parts coke, cinders, or coal; and 5 parts iron turnings, all in coarse powder, to a full red heat in an open crucible, stirring occasionally until small jets of purple flame are no longer seen. When cool, the soluble matter is dissolved out of it, the solution filtered, evaporated, and crystallized. The crystals obtained are redissolved in hot water and cooled very slowly, forming large yellow crystals of the ferrocyanide of potassium of commerce. In order to obtain a pure article, fuse effloresced commercial prussiate of potash in a glass vessel, dissolve the fused mass in water, neutralize any excess of alkali with acetic acid, and precipitate the salt with strong alcohol; wash the precipitate with a little weak alcohol, redissolve it in water, and crystallize. (*Cooley.*)

4202. Cyanide (Cyanuret) of Potassium. Mix thoroughly 8 ounces of dry ferrocyanide of potassium and 3 ounces dry carbonate of potassa; throw the mixture into a deep red-hot earthen crucible, the heat being sustained until effervescence ceases, and the fluid portion of the mass becomes colorless; after a few minutes' rest, to allow the contents to settle, the clear portion is poured from the heavy black sediment at the bottom on a clean marble slab; and, while yet warm, broken up and placed in well-closed bottles. When pure, this salt is colorless and odorless, its crystals are cubic or octahedral, and are anhydrous. If it effervesces with acids, it contains carbonate of potassa. If it be yellow, it contains iron. (*Liebig.*)

THE TECHNO-CHEMICAL RECEIPT BOOK 1896

Production of Cyanide of Potassium, Ammonia, Tar, and Gas from Nitrogeneous Organic Substances. Leather waste, blood, wool, hair, etc., are saturated with a solution of potash and then dried. The mass is then heated

in retorts, but not to the melting point. Ammonia, gas, and tar are caught up in the usual manner. The residue contains cyanide and cyanate of potassium, sulphocyanide of potassium, calcium carbonate, potassium hydrate, potassium sulphide, and carbon. In the presence of metallic iron or ferrous oxide the cyanide of potassium is converted into ferrocyanide of potassium by lixiviation. After separating this the solution may again serve for impregnating nitrogeneous substances. The potassium hydrate present is converted into carbonate by treating the solution with carbonic acid. In case the raw materials are contaminated with sand it is removed by washing with potash-lye.

THE ENCYCLOPEDIA BRITANNICA 1892
See page 95, column right.

POTASSIUM METALS. Under this heading we treat of potassium, rubidium, and cæsium; SODIUM and LITHIUM, being less closely allied to potassium, have special articles devoted to them.

Potassium.—The three metals under consideration are all very widely diffused throughout nature; but only potassium is at all abundant, and therefore we begin with it. The richest natural store is in the ocean, which, according to Bogusiawski's calculation (in his *Oceanographie*) of its total volume and the present writer's analysis of sea water, contains potassium equal to 1141 times 10^{12} tons of sulphate, K_2SO_4. This inexhaustible store, however, is not much drawn upon at present; the "salt-gardens" on the coast of France have lost their industrial importance as potash-producers, if not otherwise, since the rich deposits at Stassfurt in Germany have come to be so largely worked. These deposits, in addition to common salt, include the following minerals:—sylvine, KCl; carnallite, $KCl.MgCl_2 + 6H_2O$ (transparent deliquescent crystals, often red with diffused oxide of iron); kainite, $K_2SO_4.MgSO_4.MgCl_2 + 6H_2O$ (hard crystalline masses, permanent in the air); kieserite (a hydrated sulphate of magnesia which is only *very slowly* dissolved by water); besides boracite, anhydrite ($CaSO_4$), and other minor components lying outside the subject of this article. The potassium minerals named are not confined to Stassfurt; far larger quantities of sylvine and kainite are met with in the salt-mines of Kalusz in the eastern Carpathian Mountains, but they have not yet come to be worked so extensively. The Stassfurt potassiferous minerals owe their industrial importance to their solubility in water and consequent ready amenability to chemical operations. In point of absolute mass they are insignificant compared with the abundance and variety of potassiferous silicates, which occur everywhere in the earth's crust; orthoclase (potash felspar) and potash mica may be quoted as prominent examples. Such potassiferous silicates are found in almost all rocks, if not as normal at least as subsidiary components; and their disintegration furnishes, directly or indirectly, the soluble potassium salts which are found in all fertile soils. These salts are sucked up by the roots of plants, and by taking part in the process of nutrition are partly converted into oxalate, tartrate, and other organic salts, which, when the plants are burned, assume the form of carbonate, K_2CO_3. It is a remarkable fact that, although in a given soil the soda may predominate largely over the potash salts, the plants growing in the soil take up the latter by preference: in the ashes of most land plants the potash (calculated as K_2O) forms upwards of 90 per cent. of the total alkali (K_2O or Na_2O). The proposition holds, in its general sense, for sea plants likewise. In ocean water the ratio of soda (Na_2O) to potash (K_2O) is 100 : 3·23 (Dittmar); in kelp it is, on the average, 100 : 5·26 (Richardson). Ashes particularly rich in potash are those of burning nettles, wormwood (*Artemisia Absinthium*), tansy (*Tanacetum vulgare*), fumitory (*Fumaria officinalis*), tobacco. In fact the ashes of herbs generally are richer in potash than those of the trunks and branches of trees; yet, for obvious reasons, the latter are of greater industrial importance as sources of carbonate of potash.

Carbonate of Potash (K_2CO_3) in former times used to be made exclusively from wood-ashes, and even now the industry survives in Canada, Russia, Hungary, and other countries, where wood is used as the general fuel. In some places—for instance, in certain districts of Hungary—wood is burned expressly for the purpose; as a rule, however, the ashes produced in households form the raw material. The ashes are lixiviated with water, which dissolves all the carbonate of potash along with more or less of chloride, sulphate, and a little silicate, while the earthy phosphates and carbonates and other insoluble matters remain as a residue. The clarified solution is evaporated to dryness in iron basins and the residue calcined to burn away particles of charcoal and half-burned organic matter. In former times this calcination used to be effected in iron pots, whence the name "potashes" was given to the product; at present it is generally conducted in reverberatory furnaces on soles of cast-iron. The calcined product goes into commerce as crude potashes. The composition of this substance is very variable,—the percentage of real K_2CO_3 varying from 40 to 80 per cent. The following analysis of an American "potashes" is quoted as an example.

Carbonate of potash	71·4	Water	4·5
,, soda	2·3	Insoluble matter	2·7
Sulphate of potash	14·4		
Chloride of potassium	3·6		98·9

Crude potashes is used for the manufacture of glass, and after being causticized for the making of soft soap. For many other purposes it is too impure and must be refined, which is done by treating the crude product with the minimum of cold water required to dissolve the carbonate, removing the undissolved part (which consists chiefly of sulphate), and evaporating the clear liquor to dryness in an iron pan. The purified carbonate (which still contains most of the chloride of the raw material and other impurities) is known as "pearl ashes."

Large quantities of carbonate used to be manufactured from the aqueous residue left in the distillation of beetroot spirit, *i.e.*, indirectly from beetroot molasses. The liquors are evaporated to dryness and the residue is ignited to obtain a very impure carbonate, which is purified by methods founded on the different solubilities of the several components. Such potashes, however, is exceptionally rich in soda: Grandeau found in crude ashes from 16 to 21 per cent. of potash and from 23 to 50 of soda carbonate. This industry would have expired by this time were it not that the beetroot spirit residues are worked for trimethylamine (see METHYL, vol. xvi. p. 196), and the carbonate thus obtained incidentally. Most of the carbonate of potash which now occurs in commerce is made from Stassfurt chloride by means of an adaptation of the "Leblanc process" for the conversion of common salt into soda ash (see SODIUM).

Chemically pure carbonate of potash is best prepared by the ignition of pure bicarbonate (see below) in iron or (better) in silver or platinum vessels, or else by the calcination of pure bitartrate (see TARTARIC ACID). The latter operation furnishes an intimate mixture of the carbonate with charcoal, from which the carbonate is extracted by lixiviation with water and filtration. The filtrate is evaporated to dryness (in iron or platinum) and the residue fully dehydrated by gentle ignition. The salt is thus obtained as a white porous mass, fusible at a red heat (838° C., Carnelley) into a colourless liquid, which freezes into a white opaque mass. The dry salt is very hygroscopic; it deliquesces into an oily solution ("oleum tartari") in ordinary air. 100 parts of water dissolve—

at 0° C.	20° C.	135° C. (boiling point of saturated solution)
83	94	205

parts. Carbonate of potash, being insoluble in strong alcohol (and many other liquid organic compounds), is much used for the dehydration of the corresponding aqueous preparations. From its very concentrated solution in hot water the salt crystallizes on cooling with a certain proportion of water; but these crystals are little known even to chemists. Pure carbonate of potash is being constantly used in the laboratory, as a basic substance generally, for the disintegration of silicates, and as a precipitant. The industrial preparation serves for the making of flint-glass, of potash soap (soft soap), and of caustic potash. It is also used in medicine, where its old name of "sal tartari" is not yet quite obsolete.

Bicarbonate of Potash ($K_2OCO_2+H_2OCO_2=2KHCO_3$) is obtained when carbonic acid is passed through a cold solution of the ordinary carbonate as long as it is absorbed. If silicate is present, it likewise is converted into bicarbonate with elimination of silica, which must be filtered off. The filtrate is evaporated at a temperature not exceeding 60° or at most 70° C.; after sufficient concentration it deposits on cooling anhydrous crystals of the salt, while the chloride of potassium, which may be present as an impurity, remains mostly in the mother-liquor; the rest is easily removed by repeated recrystallization. If an absolutely pure preparation is wanted, it is best to follow Wöhler and start with the "black flux" produced by the ignition of pure bitartrate. The flux is moistened with water and exposed to a current of carbonic acid, which, on account of the condensing action of the charcoal, is absorbed with great avidity. The rest explains itself. Bicarbonate of potash forms large monoclinic prisms, permanent in the air. 100 parts of water dissolve—

at 0°	10°	20°	60°	70°
19·61	23·23	26·91	41·35	45·24

parts of salt. At higher temperatures than 70° the solution loses carbonic acid quickly. The solution is far less violently alkaline to the taste and test-papers than that of the normal carbonate. Hence it is preferred in medicine as an anti-acid. When the dry salt is treated it breaks up below redness into normal carbonate, carbonic acid, and water.

Caustic Potash (*Hydrate of Potassium*), KHO.—It has been known for a long time that a solution of carbonate of potash becomes more intensely alkaline, acts more strongly on the epidermis, and dissolves fats more promptly after it has been treated with slaked lime. It used to be supposed that the latent fire in the quick-lime went into the "mild" alkali and made it "caustic," until Black, about the middle of last century, showed that the chemical difference between the two preparations is that the mild is a compound of carbonic acid and the caustic one of water with the same base (potash),—the causticizing action of the lime consisting in this, that it withdraws the carbonic acid from the alkali and substitutes its own water. Add to this that the exchange takes place only in the presence of a sufficient proportion of water, and that it is undone if the mixture is allowed to get concentrated by evaporation beyond a certain (uncertain) point, and you have a full theory of the process. A good concentration is twelve parts of water for one of carbonate of potash; the lime is best employed in the shape of a semi-fluid paste, made by slaking quick-lime with three parts of water poured on at a time. The alkali solution is heated to boiling in a cast-iron vessel (industrially by means of steam-pipes) and the lime paste added in instalments until a sample of the filtered mixture no longer effervesces on addition of an excess of acid. The mixture is then allowed to settle in the iron vessel, access of air being prevented as much as practicable, and the clear liquor is drawn off by means of a syphon. The remaining mud of carbonate and hydrate of lime is washed, by decantation, with small instalments of hot water to recover at least part of the alkali diffused throughout it, but this process must not be continued too long or else some of the lime passes into solution. The united liquors are boiled down in an iron vessel until the desired degree of concentration is reached. In obedience to an old tradition, the concentration is habitually continued until the specific gravity of the cold ley is 1·333, which is a rather inconveniently high degree of strength for most purposes, but in the case of the ordinary commercial article offers this advantage, that any sulphate of potash which may be present as an impurity crystallizes out completely on standing (Liebig). If solid caustic potash is wanted, the ley (after removal of the deposit of sulphate, &c.) is transferred to a *silver* dish, and the evaporation continued until, instead of steam, the heavy vapour of KHO itself is seen to go off. The residual oily liquid is then poured out into a polished iron tray, or into an iron mould to produce the customary form of "sticks," and allowed to cool. The solidified preparation must be at once bottled up, because it attracts the moisture and carbonic acid of the air with great avidity and deliquesces. According to the present writer's experience (*Journ. Soc. Chem. Ind.*, May 1884), nickel basins are far better adapted than iron basins for the concentration of potash ley. The latter begin to oxidize before the ley has come up to the traditional strength, while nickel is not attacked so long as the percentage of *real* KHO is short of 60. For the fusion of the dry hydrate nickel vessels cannot be used; in fact, even silver is perceptibly attacked as soon as *all* the excess of water is away; absolutely pure KHO can be produced only in *gold* vessels. Regarding the action of potash on platinum, see PLATINUM (*supra*, p. 191). Glass and (to a less extent) porcelain are attacked by caustic potash ley, slowly in the cold, more readily on boiling.

Frozen caustic potash forms an opaque, white, stone-like mass of dense granular fracture; specific gravity = 2·1. It fuses considerably below and is perceptibly volatile at a red heat. It is extremely soluble in even cold water, and in any proportion of water on boiling. The solution is intensely "alkaline" to test-papers. It readily dissolves the epidermis of the skin and many other kinds of animal tissue,—hence the well-known application of the "sticks" in surgery. A dilute potash ley readily emulsionizes fats, and on boiling "saponifies" them with formation of a soap and of glycerin. Caustic potash is the very type of an energetic (mono-acid) basic hydrate (see CHEMISTRY, vol. v. pp. 486, 488).

According to Tünnermann's and Schiff's determinations, as calculated by Gerlach, the relation in pure potash ley between specific gravity at 15° C. and percentage strength is as follows:—

Percentages of KHO or K_2O.	Specific Gravity, if percentage refers to		Percentages of KHO or K_2O.	Specific Gravity, if percentage refers to	
	K_2O.	KHO.		K_2O.	KHO.
0	1·000	1·000	25	1·285	1·230
1	1·010	1·009	30	1·355	1·288
10	1·099	1·083	40	1·504	1·411
15	1·154	1·128	50	1·660	1·539
20	1·215	1·177	60	1·810	1·667

All commercial caustic potash is contaminated with excess of water (over and above that in the KHO) and with carbonate and chloride of potassium; sulphate, as a rule, is absent. Absolutely pure potash has perhaps never been seen; a preparation sufficing for most purposes of the analyst is obtained by digesting the commercial article in strong (85 per cent. by weight) *pure* alcohol. The hydrate KHO dissolves in the alcohol of the solvent; the chloride and the carbonate unite with the water and form a lower layer or magma, from which the alcoholic solution of the KHO is decanted off, to be evaporated to dryness and fused in silver vessels ("potasse à l'alcool").

The metal (potassium) has been known to exist since Lavoisier, but was first obtained as a substance by Humphry Davy in 1807. He prepared it from the hydrate by electrolysis. Gay-Lussac and Thénard subsequently found that this substance can be reduced to the metallic state more easily by passing its vapour over white hot metallic iron; but even their method as a mode of preparation was soon superseded by Brunner's, who, to the surprise of his contemporaries, produced the metal by simply distilling its carbonate with charcoal—applying an old-established principle of ordinary metallurgy. Brunner's process is used to the present day for the production of the metal.

One of those cylindrical, neckless, wrought-iron bottles which serve for the storing of quicksilver is made into a retort by taking out the screw-plug at the centre of one of the round ends and substituting for it a short, ground-in, iron outlet pipe. This retort is charged with a black flux made from a mixture of pure and crude bitartrate so adjusted that the flux contains as nearly as possible the proportion of free carbon demanded by the equation $K_2CO_3 + 2C = 2K + 3CO$. It is then suspended horizontally within a powerful wind-furnace, constructed for coke as fuel. At first a mixture of coke and charcoal is applied, to produce the right temperature for chasing away the moisture and enabling one to, so to say, varnish over the retort with borax and thus protect it against the subsequent intense heat. After these preliminaries coke alone is used and the fire urged on to, and maintained at, its maximum pitch, when potassium vapour soon begins to make its appearance. The condensation of this vapour, however, demands special methods, because even the cold metal would quickly oxidize in the air and act most violently on liquid water. Brunner used to condense the vapour by passing it into a small copper vessel charged with rock-oil (see PARAFFIN, vol. xviii. p. 237), in which liquid the condensed metal sinks to the bottom and thus escapes the air. Donné and Maresca dispense with rock-oil altogether; they receive the vapour in a dry condenser made of two flat rectangular trays of wrought iron which fit closely upon each other, enclosing a space such as might be used as a mould for casting a thin cake of any ordinary metal. This condenser has a short neck into which the outlet pipe of the retort fits; and the pipe must be as short as possible, because it is essential (Donné and Maresca) that the hot vapour pass abruptly from its original high to a low temperature, to evade a certain range of medium temperatures at which the metal combines with carbonic oxide into a black solid, which may obstruct the outlet pipe. The formation of this bye-product cannot be altogether avoided; hence a long borer is inserted into the condenser from the first to enable one to clear the throat of the retort at a moment's notice. The condenser is kept as far as possible cold by the constant application to it of damp cloths. As soon as the distillation is finished the (still hot) condenser is plunged into a bucketful of rock-oil, to cool it down, the mould opened (under the oil), and the now solid metal taken out. The crude metal is always contaminated with some of the black solid and other mechanical impurities. To remove these the best method is to redistil it from out of a small iron retort and condense the vapour in rock-oil according to Brunner's original plan. The purified metal is soft enough to be moulded (under rock-oil) into globular pieces, which are preserved in bottles filled to the top with the protecting liquid. But even this does not prevent gradual oxidation; bright metallic potassium can be maintained in this condition only by preserving it in a sealed-up glass tube within a vacuum or in an atmosphere of hydrogen or some other inert gas. The black solid above referred to is a most dangerous substance. When exposed to the air it turns red and then explodes either spontaneously or on the slightest provocation by friction or pressure. Even if kept under rock-oil it gradually becomes explosive. The distillation of potassium, in fact, is a dangerous operation, which had better be left in the hands of specialists.

Pure potassium is a bluish-white metal; but on exposure to ordinary air it at once draws a film of oxide, and on prolonged exposure deliquesces into a solution of hydrate and carbonate. At temperatures below 0° C. it is pretty hard and brittle; at the ordinary temperature it is so soft that it can be kneaded between the fingers and cut with a blunt knife; specific gravity = 0·865. It fuses at 62°·5 C. (Bunsen), and at 720° to 730° C. (Carnelley and Williams), *i.e.*, considerably below its boiling point, begins to distil with formation of an intensely green vapour. When heated in air it fuses and then takes fire and burns into a mixture of oxides. Most remarkable, and characteristic for the group it represents, is its action on water. A pellet of potassium when thrown on water at once bursts out into a violet flame and the burning metal fizzes about on the surface, its extremely high temperature precluding absolute contact with the liquid, except at the very end, when the last remnant, through loss of temperature, is wetted by the water and bursts with explosive violence. What really goes on chemically is that the metal decomposes the water thus, $K + H_2O = KHO + H$, and that the hydrogen catches fire, the violet colour of the flame being due to the potassium vapour diffused throughout it. Similar to that on water is its action on alcohol: the alcohol is converted into ethylate, while hydrogen escapes, $K + C_2H_5 . OH = C_2H_5 . OK + H$, this time without inflammation. So strong is the basilous character of the element that, in opposition to it, even ammonia behaves like an acid. When the oxide-free metal is heated gently within the dry gas it is gradually transformed into a blue liquid, which on cooling freezes into a yellowish-brown or flesh-coloured solid. This body is known as "potassamide," KNH_2. When heated by itself to redness the amide is decomposed into ammonia and nitride of potassium, $3NH_2K = NK_3 + 2NH_3$. The nitride is an almost black solid. Both it and the amide decompose water readily with formation of ammonia and caustic potash. Potassium at temperatures from 200° to 400° C. "occludes" hydrogen gas, as palladium does (see "Palladium," under PLATINUM, *supra*, p. 193). The highest degree of saturation corresponds approximately to the formula K_2H for the "alloy," or to about 126 volumes of gas (measured cold) for one volume of metal. In a vacuum or in sufficiently dilute hydrogen the compound from 200° upwards loses hydrogen, until the tension of the free gas has arrived at the maximum value characteristic of that temperature (Troost and Hautefeuille).

Potassium Oxides, singularly, can be produced only from the metal, and another remarkable fact is that the one with which all chemical students imagine they are so familiar—namely, "anhydrous potash," K_2O—is little more than a fiction. According to Vernon Harcourt, when the metal is heated cautiously, first in dry air and then in dry oxygen, it is transformed into a white mass (K_2O_2 ?), which, however, at once takes up more oxygen with formations ultimately of a yellow powdery tetroxide (K_2O_4), fusible at a red heat without decomposition. At a white heat it loses oxygen and leaves a residue of lower oxides (K_2O ?). When heated in hydrogen it is reduced to ordinary potash, KHO. When dissolved in excess of dilute acid it yields a mixed solution of the respective potash salt and peroxide of hydrogen, with abundant evolution of oxygen gas.

Potassium Salts.—There is only one series of these known,—namely, the salts produced by the union of potash (KHO) with acids.

Chloride, KCl.—This salt (commercial name, "muriate of potash") is at present being produced in immense quantities at Stassfurt from the so-called "Abraumsalze." For the purpose of the manufacturer of muriate these are assorted into a raw material containing approximately in 100 parts—55-65 of carnallite (representing 16 parts of chloride of potassium); 20-25 of common salt; 15-20 of kieserite, a peculiar, very slowly soluble sulphate of magnesia, $MgSo_4 . H_2O$; 2-4 of tachhydrite ($CaCl_2 . 2MgCl_2 + 12H_2O$); and minor components. This mixture is now wrought mainly in two ways. (1) The salt is dissolved in water with the help of steam, and the solution is cooled down to from 60° to 70°, when a quantity of impure common salt crystallizes out, which is removed. The decanted ley deposits on cooling and standing a 70 per cent. muriate of potash, which is purified, if desired, by washing it by displacement with cold water. Common salt principally goes into solution, and the percentage may thus be brought up to from 80 to 95. The mother-liquor from the 70 per cent. muriate is evaporated down further, the common salt which separates out in the heat removed as it appears, and the sufficiently concentrated liquor allowed to crystalliza, when almost pure carnallite separates out, which is easily decomposed into its components (see *infra*). (2) Ziervogel and Tuchen's method. The crude salt is ground up and then heated in concentrated solution of chloride of magnesium with mechanical agitation. The carnallite principally dissolves and crystallizes out relatively pure on cooling. The mother-liquor is used for a subsequent extraction of fresh raw salt. The carnallite produced is dissolved in hot water and the solution allowed to cool, when it deposits a coarse granular muriate of potash containing up to 99 per cent. of the pure substance. The undissolved residue produced in either process consists chiefly of kieserite and common salt. It is worked up either for Epsom salt and common salt, or for sulphate of soda and chloride of magnesium. The potassiferous bye-products are utilized for the manufacture of manures.

Chemically pure chloride of potassium is most conveniently prepared from pure perchlorate (see *infra*) by dioxygenating it in a platinum basin at the lowest temperature and then fusing the residue in a well-covered platinum crucible. The fused product solidifies on cooling into a colourless glass. Chloride of potassium dissolves in water and crystallizes from the solution in anhydrous cubes. 100 parts of water dissolve—

at 0°	10°	20°	50°	100° C.
29·2	32·0	34·7	42·8	56·6

parts of the salt. When a sufficiency of hydrochloric-acid gas is passed into the solution the salt is completely precipitated as a fine powder. If the original solution contained chloride of magnesium or calcium or sulphate of potash, all impurities remain in the mother-liquor (the SO_3 as $KHSO_4$), and can be removed by washing the precipitate with strong hydrochloric acid. Chloride of potassium fuses at 738° C. (Carnelley), and at a red heat volatilizes rather abundantly.

Chlorate, $KClO_3$.—This industrially important salt was discovered in 1786 by Berthollet, who correctly designated it as "peroxidized muriate." Chlorine gas is largely absorbed by cold caustic-potash ley with formation of chloride and hypochlorite, $2KHO + Cl_2 = KCl + KClO + H_2O$. When the mixed solution is boiled it suffers, strictly speaking, a complicated decomposition, which, however, in the main comes to the same as if the hypochlorite broke up into chloride and chlorate, $3KClO = 2KCl + KClO_3$. Hence chlorate of potash is easily produced by passing chlorine into hot caustic-potash ley so as at once to realize the change, $6KHO + 3Cl_2 = 3H_2O + 5KCl + KClO_3$; and this method used to be followed industrially until Liebig pointed out that five-sixths of the potash can be saved by first substituting milk of lime, $Ca(OH)_2 = 2caOH$, for the potash ley and from the mixed solution of lime-salts precipitating, so to say, the chloric acid as potash salt by adding 1KCl for every $1caClO_3$ present, concentrating by evaporation, and allowing the $KClO_3$ to crystallize out. This is the present industrial process. For the technical details we must refer to the handbooks of chemistry. Suffice it to say that in practice about 1·03 times KCl are used for every $1caClO_3$, and that the salt produced is almost chemically pure after one recrystallization. By repeated recrystallization every trace of impurities is easily removed. The crystals are colourless transparent monoclinic plates, which, unless formed very slowly, are very thin, so as often to exhibit the Newton's colours. 100 parts of water dissolve—

at 0°	15°	50°	104°·5 (on boiling)
3·3	6	19	60

parts of the salt (Gay-Lussac). The salt is almost insoluble in strong alcohol. It is permanent in the air. It fuses at 359° C. (Carnelley), and at about 18° above the temperature of its formation the liquid gives off oxygen *with evolution of heat*, and formation ultimately of chloride (and oxygen). The salt accordingly, in opposition to any combustible matter with which it may be mixed, behaves at the same time as a store of highly-condensed loosely-combined oxygen and of potential heat. Hence its manifold applications in artillery and pyrotechnics are easily understood. To give one example of the readiness with which it acts as a burning agent: a mixture of it and sulphur when struck with a hammer explodes loudly, the mechanical blow sufficing to produce locally the temperature necessary for starting the reaction. When the salt was still a novelty it was tried as a substitute for the nitre in gunpowder. Such powder, however, proved too good to be safe. More recently a mixture of 49 parts of the chlorate, 23 of sugar, and 28 of prussiate of potash was recommended by Pohl as a preferable substitute for gunpowder, but this powder has never come into actual use anywhere. We must not forget to point out that mixtures of chlorate of potash and combustible substances must on no account be made in a mortar; this would be sure to lead to dangerous explosions. The several ingredients must be powdered separately and only then be mixed together on a sheet of paper or on a table, all unnecessary pressure or friction being carefully avoided.

The decomposition of chlorate of potash by heat is greatly facilitated by admixture of even small proportions of certain solid oxides, *e.g.*, oxide of copper, of iron, or of manganese. The oxygen, in the case of binoxide of manganese, for instance, comes off below the fusing point of the salt. Hence a salt contaminated with even a small proportion of heavy metallic chlorate cannot (in general) be fused without decomposition. The writer observed this anomaly with a commercial chlorate which happened to contain about one half per cent. of chlorate of zinc. The aqueous solution of the salt is neutral and bears prolonged boiling without decomposition. On acidification with dilute sulphuric acid it assumes the reactions of a solution of chloric acid, *i.e.*, of a powerful but readily controllable oxydant. In this capacity it is used in calico-printing as a "discharge." In the same industry it serves for making the chlorate of soda needed for the production of aniline black. In the chemical laboratory it is in constant requisition as a source of oxygen and as an oxidizing agent. In the hands of Marignac it served for the determination of the important ratio KCl : 3O.

Perchlorate, $KClO_4$.—The decomposition of chlorate of potash by heat, if catalytic agents like MnO_2, &c., are absent, proceeds by two stages. In the first the salt breaks up thus, $2KClO_3 = KCl + O_2 + KClO_4$; in the second the perchlorate at a higher temperature is decomposed into chloride and oxygen. The termination of the first stage is marked by a slackening in the evolution of the oxygen and by the residual salt (which, at the beginning, is a thin fluid) becoming pasty. From the mixture $KCl + KClO_4$ the chloride is extracted by lixiviation with successive instalments of cold water. The residual perchlorate is *very easily* purified by recrystallization (compare pure chloride of potassium, *supra*). Perchlorate of potash dissolves in 88 parts of water of 10°C., and in far less of boiling water. It is absolutely insoluble in absolute alcohol. It begins to give off its oxygen at about 400° C., which is below its fusing point. The salt has been recommended as a substitute for chlorate in pyrotechnic mixtures, because it contains more oxygen, and yet, on account of its greater stability, is a less dangerous ingredient.

Bromide, KBr.—This salt is formed when bromine is dissolved in caustic-potash ley. The reaction is quite analogous to that going on in the case of chlorine; only the hypobromite (KBrO) first produced is far less stable than hypochlorite, and vanishes after short heating. The addition of bromine is continued until the liquid is permanently yellow and retains its colour after short heating. The solution is then evaporated to dryness and the bromate decomposed by cautious heating. A small portion of the bromate breaks up into $K_2O + Br_2 + 5O$; hence the residual bromide is contaminated with a little free alkali; but this is easily set right by neutralizing its solution with hydrobromic acid. The salt crystallizes in colourless transparent cubes, easily soluble in water. It is used in medicine for quieting the nerves,—to cure sleeplessness, for instance; also (internally) as a local anæsthetic preparatory to operations on the larynx or the eye. The dose of the pure (KI free) salt for adults can safely be raised to 2 grammes (about 30 grains). It is also used in photography.

Iodide, KI.—Of the very numerous methods which have been recommended for the preparation of this important salt the simplest (and probably the best) is to dissolve in a caustic-potash ley (which is dilute enough to hold the rather difficultly soluble iodate KIO_3 in solution) enough iodine to produce a permanent yellow colour (the iodine passes at once into $5KI + KIO_3$; the hypo body KIO has no existence practically) and to deoxidize the iodate, which is done most conveniently by adding a sufficiency of powdered charcoal to the solution, evaporating to dryness in an iron vessel, and heating the residue. The oxygen goes off as CO_2 at a lower temperature than that which would be needed for its expulsion as oxygen gas. The residue is dissolved, and the solution filtered and evaporated to crystallization. The salt comes out in colourless transparent cubes, very easily soluble in even cold water. The commercial salt forms opaque milk-white crystals, which, as a matter of habit, are preferred to the clear salt, although they are produced by causing the salt to crystallize from a strongly alkaline solution and by drying the crystals (finally) in a stream of hot air, and although through the former operation they are at least liable to contain carbonate. Iodide of potassium acts far more powerfully on the human system than bromide, and therefore is administered in smaller doses. It is used against skin-diseases, and also for eliminating the mercury which settles in the system after long-continued administration of mercurial medicines. It is also used, far more largely than the bromide, in photography. See PHOTOGRAPHY, *passim*.

Sulphate (K_2SO_4) used to be extracted from kainite, but the process is now given up because the salt can be produced cheaply enough from the muriate by decomposing it with its exact equivalent of oil of vitriol and calcining the residue. To purify the crude product it is dissolved in hot water and the solution filtered and allowed to cool, when the bulk of the dissolved salt crystallizes out with characteristic promptitude. The very beautiful (anhydrous) crystals have as a rule the habitus of a double six-sided pyramid, but really belong to the rhombic system. They are transparent, very hard, and absolutely permanent in the air. They have a bitter salty taste. 100 parts of water dissolve—

at 0°	12°	100° C.
8·36	10	26

parts of the salt. Sulphate of potash fuses at a strong red heat, and at this temperature volatilizes, for an alkaline salt, rather slowly. The chloride, weight for weight, volatilizes at ten times the rate (Bunsen). Sulphate of potash used to be employed in medicine, but is now obsolete. The crude salt is used occasionally in the manufacture of glass.

Bisulphate ($KHSO_4$) is readily produced by fusing thirteen parts of the powdered normal salt with eight parts of oil of vitriol. It dissolves in three parts of water of 0° C. The solution behaves pretty much as if its two congeners, K_2SO_4 and H_2SO_4, were present side by side of each other uncombined. An excess of alcohol, in fact, precipitates normal sulphate (with little bisulphate) and free acid remains in solution. Similar is the behaviour of the fused dry salt at a dull red heat; it acts on silicates, titanates, &c., as if it were sulphuric acid raised beyond its natural boiling point. Hence its frequent application in analysis as a disintegrating agent.

For the following potash salts we refer to the articles named:—*Chromates*, see CHROMIUM; *Cyanide* and *Ferrocyanide*, PRUSSIC ACID; *Chloroplatinate*, PLATINUM (*supra*, p. 192); *Nitrate*, NITROGEN (vol. xvii. p. 518); *Phosphates*, PHOSPHORUS (vol. xviii. pp. 818-19); *Oxalates*, OXALIC ACID; *Sulphides* and *Sulphites*, SULPHUR; *Silicates*, GLASS (vol. x. p. 655 *sq.*) and SILICA; *Tartrates*, TARTARIC ACID. For potash salts not named, see the handbooks of chemistry.

Rubidium and Cæsium.—When Bunsen and Kirchhoff in 1860 applied their method of spectrum analysis to the alkali salts which they had extracted analytically from Dürkheim mineral water. they obtained a spectrum which in addition to the lines characteristic for sodium, potassium, and lithium, exhibited two blue lines which were foreign to any other spectrum they had ever seen. They accordingly concluded that these lines must be owing to the presence of a new alkali metal, which they called "cæsium." Bunsen at once resumed the preparation of the mixed alkaline salt with 44,000 litres of Dürkheim water, with the view of isolating the cæsium in the form of a pure salt; and he was more than successful—for the new alkali salt, after elimination of all the ordinary alkali metals, proved to be a mixture of the salts of *two* new alkali metals, which he succeeded in separating from each other. For one he retained the name already chosen; the other he called "rubidium," on account of the presence in his spectrum of certain characteristic red lines. Since Bunsen's time these two metals have been discovered in a great many native potassiferous materials—minerals, mineral waters, plant ashes, &c.—but in all cases they form only a small fraction of the alkali, the cæsium in general amounting to only a fraction of even the rubidium. One solitary exception to both rules is afforded by a rare mineral called "pollux," which is found only on the island of Elba. Plattner analysed this mineral in 1846 and recognized it as a compound silicate of alumina, oxide of iron, soda, potash, and water; but his quantitative analysis came up to only 92·75 per cent., and he could not account for the 7·25 per cent. of loss. 'After Bunsen's discovery Pisani analysed the mineral again, and he found that it contained no potash at all, but, instead of it, a large percentage (34·1) of *cæsia*. Recalculating Plattner's analysis on the assumption that the presumed chloroplatinate of potassium was really chloroplatinate of cæsium, he found that the corrected numbers did add up to near 100 and agreed with his own. Rubidium, singularly, is absent from this mineral.

That both rubidium and cæsium are contained in sea water might well be taken for granted; but it is worth while to state that Schmidt of Dorpat actually proved the presence of rubidium, and even determined it quantitatively.

For the preparation of rubidium compounds one of the best materials is a mixture of alkaline salts, which falls as a bye-product in the industrial preparation of carbonate of lithia from lepidolite. A supply of this salt mixture which Bunsen worked up contained 20 per cent. of chloride of rubidium, 33 of chloride of potassium, and 36 of common salt, but very little cæsium; his supply came from the Saxon or Bohemian mineral. The lepidolite of Hebron, Maine, United States, on the other hand, is rich in cæsium. Another practically available source for cæsium is the mother-liquor salt of Nauheim in Germany. It yielded to Böttcher 1 per cent. of its weight of the chloroplatinate $PtCl_6Cs_2$.

Bunsen's method for the extraction of the two rare potassium metals from a given mixture of alkaline salts is founded upon the different solubility of the several alkaline chloroplatinates. According to him 100 parts of water dissolve—

	Potassium	Rubidium	Cæsium
at 0° C.	0·74	0·13	0·024
„ 20° C.	1·12	0·1[illegible]	0·079
„ 100° C.	5·13	0·[illegible]	0·377

parts of the several salts. The chloroplatinates of sodium and lithium are easily soluble even in cold water, so that chloride of platinum does not precipitate these two metals at all. Hence, supposing we boil a given mixture of chloroplatinates of potassium and (say) rubidium with a quantity of water insufficient to dissolve the whole, part of both salts will dissolve; but the residual chloroplatinate will be richer in rubidium than the dissolved part. And supposing, on the other hand, we add to a mixed solution of the two chlorides a quantity of chloroplatinic-acid solution insufficient to bring down the whole of both metals, the rubidium will accumulate in the precipitate and the potassium in the solution.' It is also easily understood that, if the amount of reagent added falls short even of that which would be needed by the rubidium if present alone, a very nearly pure $PtCl_6Rb_2$ may be expected to come down. Any dry chloroplatinate is easily reduced to a mixture of metallic platinum and alkaline chloride by the simple operation of heating in hydrogen to about 300° C. The chloride can be dissolved out, and thus again made amenable to fractional precipitation by platinum solution, and the platinum be reconverted into reagent by means of aqua regia. Hence the process is not so expensive as it might at first sight appear.

Redtenbacher has worked out an analogous process to Bunsen's, founded upon the different solubility of the three alums—$Al.R(SO_4)_2 + 12H_2O$. At 17° C. 100 parts of water dissolve of the alum of

Potassium	Rubidium	Cæsium
13·5	2·27	0·62

parts. Sodium and lithium alum are very easily soluble in water, and remain dissolved in the first mother-liquor when the mixed alum of K, Rb, and Cs crystallizes out. These three alums are parted by repeated crystallization, and the rare alkalis recovered from their respective alums by precipitation with chloride of platinum.

The separation of rubidium and cæsium offers great difficulties. According to Godeffroy an approximate separation may be effected by dissolving the mixed chlorides in strong hydrochloric acid, and adding a solution of terchloride of antimony in the same menstruum; the cæsium (chiefly) comes down as $SbCl_3 + 6CsCl$; the bulk of the rubidium remains dissolved. The two rare alkali metals are so closely similar to potassium that it will suffice to give a tabular statement of the principal points of difference. By way of introduction, however, we may state that rubidium metal was prepared by Bunsen from the black flux obtained by igniting the bitartrate, by Brunner's method for potassium. Metallic cæsium, it seems, cannot be thus obtained; but in 1883 Setterberg made it by the electrolysis of a fused mixture of the cyanides of cæsium and barium.

	Potassium.	Rubidium.	Cæsium.
Atomic weights O = 16	K = 39·136	Rb = 85·4	Cs = 133·0
Free Metals—			
Specific gravity	0·865	1·52	1·88
Fusing point	62°·5	38°·5	26° to 27° C.
Volatility increases →			
Hydrates, RHO—Very similar to one another; the basility increases →			
Chlorides, RCl	*Vide supra.* Almost insoluble in alcohol.	Permanent in air. More soluble than KCl. Soluble in alcohol.	Deliquescent.
Sulphates, R_2SO_4—			
100 parts of water dissolve .... At − 2° C.	8	?	159
„ 70° C.	19·8	42	?
Carbonates, R_2CO_3—All very soluble in water.			
100 parts of alcohol dissolve ... . At 19° C.	0	0·74	11·1
Alums / *Chloroplatinates* — Solubility decreases → (*vide supra*).			

Analysis.—In this section we treat of the detection and determination of alkali metals generally. If the given substance is a solid, a good preliminary test is to heat about one centigramme of it at one end of a fine platinum wire in the flame-mantle of a Bunsen lamp, or in a blow-pipe flame just at the end of the inner cone. Most alkali salts are sufficiently volatile to impart to the flame the colour characteristic of the respective metallic vapour. Certain native silicates and certain other compounds do not volatilize, but these can be rendered amenable to the test by mixing them with sulphate of lime and then applying the flame, whereupon alkaline sulphate is formed which volatilizes. The flame-colours are—

Potassium, Rubidium, Cæsium.	*Sodium.*	*Lithium.*
Violet.	Yellow.	Red.

These flame-reactions are very delicate but not conclusive, because in the case of mixtures several colours may be radiated out at the same time, and one may eclipse all the rest—this holds, for instance, for things containing sodium, whose flame-colour is more intense than that of any other metal—or a mixed colour may be produced which the eye is incompetent to analyse. The spectrum apparatus here comes in usefully; and by means of it it is in general possible to see the lines characteristic of the several metals in presence of, or at least after, one another, because as a rule the several metals are present as compounds of different volatility.

For a thorough analysis it is necessary to begin by bringing the substance into aqueous or acid solution, and next to eliminate all that is *not* alkali metal by suitable methods. A certain set of heavy metals can be precipitated as sulphides by means of sulphuretted hydrogen in the presence of acid, all the rest of these by means of sulphide of ammonium from an alkaline solution. From the filtrate, barium, strontium, and calcium are easily precipitated by means of carbonate of ammonia on boiling, so that, if the filtrate from these carbonates is evaporated to dryness and the residue kept at a dull red heat long enough to drive away the ammonia salts, nothing can be left but salts of alkali metals and magnesium. This residue is dissolved in a *small* quantity of water, and any residual basic salt of magnesium filtered off. The filtrate is then ready to be tested for alkali metals as follows: *if magnesia be absent*, potassium or rubidium (not cæsium) can be detected by addition (to a neutral or feebly acetic solution) of a saturated solution of bitartrate of soda. Potassium and rubidium come down as crystalline bitartrates. The reaction may take some time to become manifest, but can be accelerated by vigorous stirring. In a separate quantity of the solution lithium may be searched for by means of carbonate of soda or trisodic phosphate as explained under LITHIUM (vol. xiv. p. 697). For soda we have no characteristic precipitant. In any case the spectrum apparatus should be used for controlling and, if necessary, supplementing the wet-way tests. The case of *magnesia being present* need not be specially considered, because the qualitative method will easily be deduced from what is said in the following paragraph.

Quantitative Determinations.—An exhaustive treatment of this subject would be out of place here. We confine ourselves to two cases. (1) A mixture of alkaline chlorides only. In this case the potassium (including Rb and Cs) is best seperated out by adding a quantity of chloroplatinic-acid solution sufficient to convert *all the metals* into chloroplatinates, to evaporate to dryness over water-bath, and from the residue to extract the lithium and sodium salts by lixiviation with alcohol of 70 per cent. (by weight). The residual chloroplatinate is collected on a filter, dried at 110° C., and, if Rb and Cs are absent, weighed as chloroplatinate of potassium, $PtCl_6K_2(PtCl_6K_2 \times 0{\cdot}3071 = 2KCl)$. The chloride of sodium is determined by difference—if lithium be absent. The case of its presence cannot be here considered. (2) A mixture of alkalis combined with sulphuric acid, or such volatile acids as can be expelled by sulphuric. In this case it is best to begin by converting the whole into neutral sulphates, and then to apply the method of Finkener, which, amongst other advantages, offers the one that it does *not* demand the absence of magnesia. The mixed sulphate is dissolved in water and the solution mixed with a little more than the volume of chloroplatinic acid ("platinum solution") demanded by the potassium (Rb and Cs). The mixture is placed in a water bath and, if necessary, diluted with sufficient water to bring the whole of the precipitated chloroplatinate into hot solution. The solution is then evaporated very nearly to dryness (on the water bath, with continuous stirring towards the end to avoid formation of crusts), allowed to cool, and the residue mixed, first with twenty times its volume of absolute alcohol, then with ten volumes of absolute ether. The mixture is allowed to stand in a well-covered vessel for some hours, to enable the precipitate to settle completely. The precipitate contains all the potassium as chloroplatinate, and most of the sodium and magnesium, and also part of the lithium in the sulphate form. It is washed with ether-alcohol (to complete filtrate A), and then lixiviated as quickly as possible with cold concentrated solution of sal-ammoniac, which dissolves away the sulphates (filtrate B). The residual chloroplatinate is dried within the filter in a porcelain crucible, which is next heated so as to char the paper at the lowest temperature. The residue is then ignited gently in hydrogen, and from the resulting residue the chloride of potassium is extracted by water, to be determined as chloroplatinate, as shown in (1), or otherwise. From the undissolved residue the charcoal is burned away and the residual platinum weighed to check the potassium determination. After removal of the ether and alcohol from filtrate A by distillation, the two filtrates A and B are mixed, evaporated to dryness, the ammonia salts chased away by heating, and the residue is reduced (at about 300° C.) in hydrogen to bring the platinum into the form of metal, from which the magnesia and alkali salts are easily dissolved away by means of water or dilute acid. The whole of the salts are then made into neutral sulphate, which is weighed and then dissolved in a known weight of water. The lithium and the magnesium are determined in aliquot parts of the solution and calculated as sulphates. The soda is found by difference. A case intermediate between (1) and (2) often presents itself in practice. We refer to the commercial muriate from Stassfurt. In such an impure muriate the potassium can be determined promptly and accurately by adding to the very concentrated solution of the substance a large excess of a very concentrated solution of chloroplatinic acid,—"excess" meaning more platinum than necessary to make all the metals into chloroplatinates. The precipitate is allowed to settle, collected on a small filter, and washed, first with successive instalments of a platinum solution (containing 5 per cent. of metal), then with ordinary alcohol; it is next dried, and weighed as above (Tatlock's method slightly modified). In exact analyses the small quantity of potassium which passes into the filtrate is recovered—ultimately by Finkener's method—and allowed for.

Cyanogen, $(NC)_2$.—When dry mercuric cyanide is heated it breaks up, below redness, into mercury and cyanogen gas; part of the latter, however, always suffers polymerization into a solid called "paracyanogen," and presumed to consist of molecules $(NC)_3$. Cyanogen gas is colourless; it has the specific gravity demanded by its formula. It possesses a peculiar odour and has a characteristic irritating effect on the eyes and mucous membranes of the nose. It is poisonous. By strong pressure it is condensible into a liquid which freezes at − 34°·4 C., and has the following vapour-tensions P at the temperatures t stated—

$t =$	− 20°·7	− 10°	0°	+ 10°	+ 20° C.
$P =$	1	1·85	2·7	3·8	5 atmos.

At ordinary temperatures water dissolves about 4·5 times, alcohol about 23 times its volume of the gas. The solutions are liable to (very complex) spontaneous decomposition. The list of products includes oxalate of ammonia and urea. Cyanogen burns with a characteristically beautiful peach-blossom coloured flame into carbonic acid and nitrogen. This gas cyanogen, as already stated, is to cyanides what chlorine gas Cl_2 is to chlorides, but it is well to remember that the analogy, though perfect in regard to the corresponding formulæ, does *not*, as a rule, extend to the conditions of formation of the bodies represented. Thus cyanogen does not unite with hydrogen into prussic acid, nor does it combine with ordinary metals in the chlorine fashion. When passed over heated potassium, it is true, it combines with it into cyanide; and caustic potash-ley absorbs it with formation of cyanide and cyanate (NCO.K), just as chlorine yields chloride and hypochlorite KClO; but this is about the sum-total of the analogies in action. Yet metallic cyanides of all kinds can be produced indirectly.

Cyanide of Potassium, NC.K.—An aqueous mixture of the quantities NCH and KHO no doubt contains this salt, but it smells of the acid, and on evaporation behaves more like a mixture of the two congeners than in any other way. An exhaustive union can be brought about by passing NCH vapour into an alcoholic solution of KHO; the salt NC.K then comes down as a crystalline precipitate, which must be washed with alcohol and dried, cold, over vitriol. A more convenient method is to dehydrate yellow prussiate and then decompose it by heating it to redness in an iron crucible. The $Fe(NC)_2$ part of the salt breaks up into cyanogen and nitrogen, which go off, and a carboniferous finely-divided iron, which remains, with cyanide of potassium, which at that temperature is a thin fluid. Yet the iron sometimes refuses to settle with sufficient promptitude to enable one to decant off the bulk even of the fused cyanide. According to private information received by the writer a French manufacturer uses a certain kind of very porous fireclay as an efficient filtering medium.

The ordinary "cyanide of potassium" of trade is not strictly that at all, but at best a mixture of the real salt with cyanate. It is produced by fusing a mixture of eight parts of anhydrous prussiate and three parts of anhydrous carbonate of potash, allowing the reaction

$$(NC)_6Fe.K_4 + K_2CO_3 = CO_2 + Fe + 5NCK + \underset{\text{Cyanate}}{K.NCO}$$

to complete itself and the iron to settle, and decanting off the clear fuse. The product goes by the name of "Liebig's cyanide," but the process was really invented by Rodgers.

Fused cyanide of potassium assumes on cooling the form of a milky white stone-like solid. It fuses readily at a red heat, and at a white heat volatilizes without decomposition, provided that it is under the influence of heat alone; in the presence of air it gradually passes into cyanate; when heated in steam it is converted into carbonate of potash with evolution of ammonia, carbonic oxide, and hydrogen. When heated to redness with any of the more easily reducible metallic oxides it reduces them to the metallic state, while it passes itself into cyanate. It also reduces the corresponding sulphides with formation of sulphocyanate; for example, Pb(S or O) + NCK = Pb + NC(O or S)K. Hence its frequent application in blowpipe analysis. When heated with chlorates or nitrates it reduces them with violent explosion. The aqueous solution of the salt has a strongly alkaline reaction; it smells of hydrocyanic acid and is readily decomposed by even such feeble acids as acetic or carbonic. It readily dissolves precipitated chloride, bromide, and iodide of silver; this is the basis of its application in photography. Large quantities of the salt are used in electroplating.

Other Binary Cyanides.—Of these only a few can be noticed here. (1) *Cyanide of sodium* is very similar to the potassium salt. The same remark, in a more limited sense, holds for the cyanides of barium, strontium, and calcium. (2) *Cyanide of ammonium* ($NC.NH_4$) forms crystals volatile at 36° C. and smelling of ammonia and hydrocyanic acid. The solution in water decomposes spontaneously, pretty much like that of the free acid. But the anhydrous vapour by itself stands a high temperature, as is proved by the fact that it is produced largely when ammonia is passed over red-hot charcoal, $C + 2NH_3 = H_2 + NCH.NH_3$. (3) *Mercuric cyanide*, $Hg(NC)_2$, forms very readily when mercuric oxide is dissolved in aqueous prussic acid. The solution on evaporation and cooling deposits crystals soluble in eight parts of cold water. This salt is not at all decomposed, even when heated, by water, nor appreciably by dilute sulphuric or nitric acid; boiling hydrochloric acid eliminates the NC as hydrocyanic acid; sulphuretted hydrogen acts similarly in the cold. It gives no precipitate with nitrate of silver, nor is it changed visibly by caustic alkalis. It readily unites not only with other cyanides but also with a multitude of other salts into crystallizable double salts. Mercurous cyanide, $Hg_2(NC)_2$, seems to have no existence. When it is attempted to produce it by double decompositions, the mixture $Hg + (NC)_2Hg$ comes forth instead of the compound $Hg_2(NC)_2$. (4) Heavy metallic cyanides are mostly insoluble in water, and the general method for their preparation is to decompose a solution of the respective sulphate, chloride, &c., with one of cyanide of potassium. The most important general property of these bodies is that they readily dissolve in solution of cyanide of potassium with formation of double cyanides, which in their capacity as double salts all exhibit, in a higher or lower degree, those anomalies which were fully explained above (see "prussiate of potash"). These "metallo-cyanides," as we will call them, being all, unlike plain cyanide of potassium, very stable in opposition to water and aqueous alkalis, are readily produced from almost any compound of the respective metallic radical—some from the metal itself—by treatment with solution of cyanide of potassium. In all we have said "potassium" may be taken as including sodium and in a limited sense ammonium, but the potassium compounds are best known, and we accordingly in the following section confine ourselves to these.

Metallo-cyanides.—(1) *Silver.*—Cyanide of silver, $Ag.NC$, is produced as a precipitate by addition of hydrocyanic acid or cyanide of potassium to solution of nitrate of silver. The precipitate is similar in appearance to chloride of silver and, like it, insoluble in cold dilute mineral acids, but soluble in ammonia. At a red heat it is decomposed with formation of a residue of carboniferous metallic silver. Precipitated cyanide of silver, though insoluble in hydrocyanic acid, dissolves readily in cyanide of potassium with formation of argento-cyanide, $AgK.(NC)_2$, which is easily obtained in crystals, permanent in the air and soluble in eight parts of cold water. Chloride of silver dissolves in cyanide of potassium solution as readily as the cyanide does and with formation of the same double salt—$AgCl + 2KNC = KCl + AgK(NC)_2$. This salt is used very largely in electro-plating. (2) *Lead.*—From a solution of the acetate cyanide of lead is precipitated by addition of hydrocyanic acid or cyanide of potassium. The precipitate, $Pb(NC)_2$, has the exceptional property of being insoluble in cyanide of potassium. (3) *Zinc.*—Cyanide of zinc, $Zn(NC)_2$, is obtained by addition of hydrocyanic acid to a solution of the acetate, as a white precipitate readily soluble in cyanide of potassium with formation of a double salt, $ZnK_2(NC)_4$, which forms well-defined crystals. (4) *Nickel.*—The cyanide, $Ni(NC)_2$, is an apple-green precipitate, which is obtained by methods similar to those given under "zinc." It readily dissolves in cyanide of potassium with formation of a crystallizable salt, $NiK_2(NC)_4 + H_2O$, the solution of which is stable in air and not convertible into one of a nickelic (Ni''') compound by chlorine (compare "cobalt" *infra*). The potassio-cyanides of silver, zinc, and nickel as solutions are not changed visibly by caustic alkalis, but their heavy metals can be precipitated by sulphuretted hydrogen or sulphide of ammonium, as from solutions of, for instance, the chlorides. Aqueous mineral acids (in the heat at least) decompose them exhaustively with elimination of all the NC as NCH. (5) *Copper.*—When cyanide of potassium solution is added to one of sulphate of copper, a yellow precipitate of cupric cyanide, $Cu(NC)_2$, comes down; but on boiling this precipitate loses cyanogen and is converted into a white precipitate of the cuprous salt $Cu(NC)$. This white precipitate dissolves in cyanide of potassium with formation chiefly of two crystalline double salts, viz., $CuNC + 6NCK$, easily soluble in water, and $CuNC + NCK$. The latter is decomposed by water with elimination of $Cu.NC$. The solution of the $6NC.K$ salt is *not* precipitated by sulphuretted hydrogen. Solutions of potassio-cyanides of cuprosum are used in electro-plating. (6) *Gold.*—Metallic gold dissolves in cyanide of potassium solution in the presence of air, thus—

$$Au + 2KNC + \frac{1}{2}O = \frac{1}{2}K_2O + AuK.(NC)_2.$$

This auro-cyanide of potassium is used largely for electro-gilding, for which purpose it is conveniently prepared as follows. Six parts of gold are dissolved in aqua regia and the solution is precipitated by ammonia. The precipitate (an explosive compound known as "fulminating gold") is dissolved in a solution of six parts of cyanide of potassium, when the double salt is formed with evolution of ammonia. The salt crystallizes in rhombic octahedra, soluble in seven parts of cold water.

In the following potassio-cyanides the heavy metals cannot be detected by means of their ordinary precipitants; these salts all behave like the potassium salts of complex radicals composed of the heavy metal and all the cyanogen. (7) *Cobalt.*—Cyanide of potassium when added to a solution of a cobaltous salt ($CoCl_2$, &c.) gives a precipitate soluble in excess of reagent. The solution presumably contains a cobalto-cyanide, $Co(NC)_2.xKNC$, but on exposure to air eagerly absorbs oxygen with formation of cobalti-cyanide, thus—

$$Co(NC)_2 + 4KNC + \frac{1}{2}O = \frac{1}{2}K_2O + Co'''(NC)_3 \; 3KNC.$$

Chlorine (Cl instead of $\frac{1}{2}O$) acts more promptly with a similar effect. If the alkaline solution is acidified and boiled, the same cobalti-cyanide is produced with evolution of hydrogen—.

$$Co(NC)_2 + 4KNC + HCl = KCl + \frac{1}{2}H_2 + Co'''(NC)_3 . 3KNC.$$

Cobalti-cyanide of potassium, $(NC)_6Co'''.K_3$, forms yellow crystals isomorphous with those of red prussiate (see *infra*). It is a remarkably stable salt. In its behaviour to reagents it exhibits none of the characters of a cobalt salt or of a simple cyanide. Aqueous mineral acids convert it into the hydrogen salt $(NC)_6Co'''.H_3$, which remains undecomposed on boiling. Heavy metallic salts produce precipitates of cobalti-cyanides; for example, $(NC)_6Co'''.Ag_3$. (8) *Ferrosum.*—See "prussiate of potash" above. (9) *Ferricum.*—Ferric hydrate and ferric compounds generally do not act upon cyanide of potassium in a manner analogous to that of ferrous compounds; but a ferri-cyanide analogous to the cobalti-salt referred to in (7) is readily produced by passing chlorine into a cold solution of ordinary prussiate, $(NC)_6Fe''.K_4 + Cl = KCl + (NC)_6fe'''.K_3$.[1] In preparing the salt an excess of chlorine and elevation of temperature must be avoided, or else part of the salt is decomposed with formation of a green precipitate. The solution on evaporation and cooling yields splendid dark red crystals, soluble in 2·54 parts of water of 15°·6 C. (Wallace), forming a most intensely yellow solution. (Ordinary prussiate solution is only pale yellow even when saturated in the cold.) This salt (discovered by L. Gmelin in 1822) is now being manufactured industrially and is known in commerce as "red prussiate." In its reactions it is analogous to ordinary yellow prussiate. The same group, $(NC)_6Fe$, which in the latter acts as a four-valent, in the red salt plays the part of a tri-valent radical, $(NC)_6fe$. But the radical thus modified has a great tendency to assume the four-valent form; hence an *alkaline* solution of red prussiate is a powerful oxidizing agent, $(NC)_6fe.K_3 + KHO = (NC)_6Fe.K_4 + HO$. The HO goes to the reducing agent. Like the yellow salt, red prussiate is not poisonous, at least when pure.

Ferro- and Ferri-cyanides of Iron.—The two prussiates are constantly being used in the laboratory as very delicate reagents for the detection of iron salt, and for the discrimination of ferrous and ferric compounds in solutions,—(1) ferro-cyanide and ferrous salt, white precipitate; (2) ferri-cyanide and ferric salt, intensely brown coloration; (3) ferro-cyanide and ferric salt, blue precipitate; (4) ferri-cyanide and ferrous salt, blue precipitate. These blue precipitates are being produced industrially and used as pigments, under the names of "prussian blue" and "Turnbull's blue" for (3) and (4) respectively. The latter has been thus known for now half a century; yet the constitution of the precipitates and the true rationale of their formation have been fully cleared up only during the last few years. The main results of the researches referred to are included in the following paragraphs.

(1) *Ferro-cyanide of Hydrogen*, $(NC)_6Fe.H_4$, is obtained as a white crystalline precipitate when air-free concentrated solution of yellow

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[1] Here we use the symbol "fe" as designating 56 parts of ferric iron,—"Fe" meaning the same quantity of ferrosum.

precipitate is mixed with hydrochloric acid and ether. It is easily soluble in water and in alcohol. An aqueous solution of it is prepared for technical purposes by mixing a strong solution of yellow prussiate with enough tartaric acid to bring down the potassium as cream of tartar. When the solution of this ferro-hydrocyanic acid is boiled half the cyanogen goes off as NCH, while the other remains as part of a white, rather unstable, precipitate, $(NC)_6Fe.\frac{Fe}{H_2}$. When the solution is exposed to the air, especially at higher temperatures, part of the cyanogen goes off as NCH, another part suffers oxidation into $H_2O + NC$, and this latter combines with the $Fe(NC)_2$ of the original compound into blue bodies similar in their general properties to prussian blue. This latter change is utilized in calico-printing for producing patterns of, or dyeing with, prussian blue. The white precipitate $(NC)_6Fe.\frac{Fe}{H_2}$ may be looked upon as an acid of which

(2) *Everett's Salt*, $(NC)_6Fe.\frac{Fe}{K_2}$, is the potash salt. This salt is produced in the ordinary process for making prussic acid (see above). It is probably identical with the white precipitate produced when ferrous salt is decomposed by prussiate of potash. Everett's salt when exposed to the air quickly absorbs oxygen and becomes blue; the reaction, as Williamson showed, assumes a simple form when the precipitate is boiled with nitric acid. One-half of the potassium is then oxidized away, and a blue double ferri-cyanide of potassium and ferrosum takes the place of the original precipitate:—

$$(NC)_6Fe.K_2Fe = \tfrac{1}{2}(K_2O \text{ as nitrate}) + \underset{\text{Williamson's blue.}}{\{(NC)_6fe\}'''Fe''K'}.$$

This blue when boiled with ferro-cyanide of potassium is reconverted into the original Everett's salt with formation of a solution of red prussiate—

$$(NC)_6fe\ \ KFe^* + K_2^*K_2.Fe(NC)_6 = \underset{\text{Red prussiate.}}{(NC)_6fe.K_3} + \underset{\text{Everett's salt,}}{Fe(NC)_6.FeK_2}$$

the asterisked radicals changing places.

(3) *Soluble Prussian Blue* is *isomeric* with Williamson's blue. It is produced by mixing a solution of ferric salt with *excess* of yellow prussiate, which, however, is an old process; what has been ascertained lately is that the very same precipitate is produced by addition to a ferrous salt of an excess of red prussiate.

$$\text{I. } (NC)_6fe.K_3 + FeCl_2 = 2KCl + (NC)_6fe.KFe = B'.$$
$$\text{II. } (NC)_6Fe.K_4 + feCl_3 = 3KCl + (NC)_6Fe.Kfe = B''.$$

B′ and B″ in the formulæ look different, but the difference is only apparent; in either case the group $(NC)_6$ is combined with 1Fe and 1fe and 1K; the bodies are identical (Skraup; Reindel). The precipitate B, though insoluble in salt solutions, is soluble in pure water, forming an intensely blue solution; hence the name.

Now the potassium in soluble prussian blue can be displaced by iron in two ways, namely, by digestion with solutions of ferrous or ferric salts. In the former case $(NC)_6feFeK$ becomes $(NC)_6feFe_{\frac{3}{2}}$, or empirically $(NC)_{12}Fe_5$; this is Gmelin's ("Turnbull's") blue. In the latter case $(NC)_6FefeK$ becomes $(NC)_6Fefe_{\frac{4}{3}}$, or empirically $(NC)_{18}Fe_7$; this is prussian blue as discovered by Diesbach. Contrasting this latter formula with that of Gmelin's blue $(NC)_{18}Fe_{7\frac{1}{2}}$, we see that the latter needs only lose ½Fe to become prussian blue; this surplus iron in fact can be withdrawn by means of nitric acid.

In the manufacture of prussian blue the general process is to first precipitate ferrous sulphate with yellow prussiate and then to fully oxidize the precipitate by means of nitric acid or chlorine as far as the oxygen of the air does not do it. The following receipt is recommended amongst others. Six parts each of green vitriol and yellow prussiate are dissolved separately, each in fifteen parts of water, and the solutions mixed. One part of concentrated sulphuric acid and twenty-four parts of fuming muriatic acid are then added, and after standing some hours also a solution of bleaching powder in instalments until the blue colour is fully developed. "Turnbull's" blue is made by precipitating red prussiate of potash with excess of ferrous salt; but it is easily seen from what was said above that the use of this relatively expensive double cyanide might be dispensed with. The properties of the two pigments are pretty much the same. They are sold in the form of solid cakes or lumps, which, in addition to their blue colour, present a coppery lustre on fracture. They are stable against acids, but sensibly affected (bleached) on prolonged exposure to sunlight; and, although they stand neutral soap fairly well, they are decomposed promptly by solutions of even the carbonates of the alkalis with formation of hydrated oxides of iron. The cheaper commercial varieties are more or less largely diluted with clay, sulphate of baryta, &c. Pure prussian blue dissolves readily in a dilute solution of oxalic acid; the intensely blue solution used to serve as a blue ink, but has come to be superseded by the several more brilliant blues of the coal-tar series. These tar-blues have displaced prussian blue also in other applications, and as a commercial pigment it has besides to struggle against ultramarine. In short, it has gone very much out of use, and as a consequence the manufacture of yellow prussiate is no longer so remunerative as it used to be.

Analysis of Cyanides.—As hydrocyanic acid and cyanide of potassium are dangerously poisonous, and the latter at least is easily procured in commerce, the detection of cyanogen in this state of combination is one of the problems of forensic chemistry. To detect such cyanogen in, say, the contents of a stomach the first step is to distil the mass after acidification with tartaric acid, which decomposes cyanide of potassium but does not liberate prussic acid from prussian blue (or even prussiate of potash?). If the distillate gives *no* precipitate with nitrate of silver hydrocyanic acid is absent, if it does the precipitate may have been produced by hydrochloric acid, which may then be eliminated by redistillation with borax or sulphate of soda, neither of which affects NCH. But even in the presence of chlorides the following two tests give perfect certainty. (1) A solution of hydrocyanic acid, when alkalinized with caustic potash and then mixed with, first ferroso-ferric salt and then excess of hydrochloric acid, gives a precipitate, or at least a green suspension, of prussian blue. (2) A solution of NCH, when mixed with ammonia and yellow sulphide of ammonium, is changed into one of sulphocyanate of ammonium, which, after removal of the excess of reagents by evaporation at a gentle heat, strikes an intense and very characteristic red colour with ferric salts, which colour does *not* vanish (as that of ferric acetate does) on even strong acidification with mineral acid (Liebig's test). The *quantitative* determination of cyanogen given as an aqueous solution of hydrocyanic acid or cyanide of potassium can (if haloids are absent) be effected by adding excess of nitrate of silver, then acidifying, if necessary, with nitric acid, filtering off, washing, drying, and weighing the cyanide of silver produced. AgNC = 134 corresponds to NCH = 27 parts. A more expeditious method has been invented by Liebig. A known quantity of the given prussic acid is alkalinized strongly with caustic potash and then diluted freely with water. The caustic alkali usually contains plenty of chloride as an impurity, else a little alkaline chloride must be added. A standard solution of nitrate of silver (conveniently adjusted so as to contain 6·30 grammes of fused nitrate per 1000 cubic centimètres, equivalent to 2 grammes of NCH) is now dropped in from a burette until the cloud of chloride of silver which appears locally from the first just fails to disappear on stirring, *i.e.*, until the reaction $2KNC + AgNO_3 = KAg.(NC)_2 + KNO_3$ has just been completed. One cub. cent. of silver solution used indicates 2 milligrammes of NCH. Liebig's method lends itself particularly well for the assaying of the medicinal acid and of cyanide of potassium. The two tests for hydrocyanic acid given above apply as they stand to solutions of the cyanides of alkali and alkaline-earth metals, but *not* to mercuric cyanide. In regard to all other cyanides we have only space to say that from a certain set (which includes the cobalti-cyanides and the platinum cyanides) cyanogen cannot be extracted at all as NCH (or AgNC) by any known methods. Such bodies must be identified by their own specific reactions or by elementary analysis. All cyanides are decomposed by *hot* concentrated sulphuric acid; the carbon goes off as CO, the nitrogen remains as sulphate of ammonia and the metals as sulphates, which brings them within the range of the routine methods of analysis.

Cyanates.—These were discovered by Wöhler. The potassium salt NCO.K is produced by the oxidation of fused cyanide, for preparative purposes most conveniently by Wöhler's method. An intimate mixture of two parts of absolutely anhydrous prussiate of potash and one part of equally dry binoxide of manganese is heated on an iron tray until the mass has become brownish black and just begun to fuse. It is now allowed to cool and exhausted by boiling 80 per cent. alcohol. The filtrate on cooling deposits crystals of the salt NCO.K. If only an aqueous solution of this salt is wanted for immediate use, the fuse may be extracted by *cold* water. From this solution the cyanate of silver, NCO.Ag, or lead, $(NCO)_2Pb$, can be prepared by precipitation with solutions of the respective nitrates or acetates. *Hot* water decomposes cyanate of potash promptly with formation of carbonates of potash and ammonia,

$KNCO + 2H_2O = NH_3 + KHO + CO_2$. On addition of mineral acid to even the cold solution only a very little of the cyanic acid is liberated as such; the bulk breaks up at once with effervescence, thus, $NCO.H + 2H_2O = NH_3 + CO_2 + H_2O$. Very interesting is the action of the solution of cyanate of potash on sulphate of ammonia; its direct effect is the formation of cyanate of ammonia, $NCO.NH_4$, but this salt almost immediately passes spontaneously into its isomer urea, which is not a cyanate at all but the amide of carbonic acid, *i.e.*, $CO(OH)_2 - 2(OH) + 2NH_3 = CO\begin{smallmatrix}NH_2\\NH_2\end{smallmatrix}$. This reaction was discovered by Wöhler, who thus for the first time produced an organic substance from inorganic materials, or virtually from its elements. Singularly, it is this pseudo-cyanate urea which serves as a material for making cyanic acid. When hydrochlorate of urea, $HCl.CON_2H_4$, is heated to 145° C. the latter behaves as if it were cyanate of ammonia: the ammonia unites with the hydrochloric acid into sal-ammoniac and the cyanic acid is set free, but immediately suffers polymerization into cyanuric acid, a solid tri-basic acid of the composition $N_3C_3O_3H_3$, which, being difficultly soluble, can be freed from the sal-ammoniac by being washed with cold water. If perfectly anhydrous cyanuric acid be subjected to dry distillation it furnishes a distillate of (liquid) cyanic acid $NCO.H$, which must be condensed in a vessel surrounded by a freezing mixture.

Cyanic acid has a very appreciable vapour-tension even at ordinary temperatures, and the least trace of its vapour makes itself felt by a characteristically violent and dangerous action on the respiratory organs. With dry ammonia gas it unites into true cyanate of ammonia. We do not know much of its own properties, because as soon as it comes out of the freezing mixture it begins to suffer polymerization into "cyamelid" with great evolution of heat. This cyamelid is a porcelain-like mass, insoluble in all ordinary solvents and devoid of acid properties. Dry distillation reconverts it into cyanic acid.

Thiocyanates.—This term means bodies like cyanates, but containing sulphur instead of the oxygen of the latter. Thiocyanates are better known, however, as sulphocyanates or sulphocyanides. (1) The potassium salt $NCS.K$ is formed when cyanide of potassium is fused with sulphur or certain metallic sulphides, *e.g.*, PbS. The usual method of preparation is to fuse together forty-six parts of dehydrated yellow prussiate of potash, seventeen of dry carbonate of potash, and thirty-two of sulphur. The fuse is exhausted with boiling alcohol and the filtered solution allowed to cool, when crystals of the salt separate out. The salt is very soluble in water with characteristically large absorption of heat. (2) The ammonium salt $NCS.NH_4$ can be prepared by allowing a mixture of alcohol, strong aqueous ammonia, and bisulphide of carbon to stand for a time and then warming it. Thiocarbonate of ammonium, $CS_2.(NH_4)_2S$, is produced first, but subsequently it gives up $2H_2S$ to the ammonia and becomes $NCS.NH_4$, which is easily obtained in crystals. The tar water obtained in the manufacture of coal-gas sometimes contains sufficient quantities of this salt to make it worth while to recover it. Both the potassium and the ammonium salt are much used as reagents, and more especially as precipitants for copper and silver. Solutions of cupric salt when mixed with sulphocyanate assume the dark-brown colour of the cupric salt $Cu(NCS)_2$, but on addition of sulphurous acid the colour disappears and a white precipitate of cuprous sulphocyanide, $NCS.Cu$, comes down, which, if enough of reagent was used, contains all the copper. If sulphocyanate is added to nitrate of silver, all the silver is precipitated as $Ag.NCS$, similar in appearance to the chloride and, like it, insoluble in water and in nitric acid. Upon this and the fact that sulphocyanates strike a deep red colour with ferric salts Volhard has based an excellent titrimetric method for the determination of silver. (See SILVER.)

Syntheses of Cyanogen Compounds.—Synthetical organic chemistry dates from Wöhler's discovery of the artificial formation of urea, and in the further development of this branch of the science cyanogen has played a prominent part. (For illustrations we may refer to certain passages in the present article and in those on METHYL and on NITROGEN.) Hence it is worth while to enumerate briefly the synthetical method for the making of cyanogen itself. (1) Hydrocyanic acid is produced when a current of electric sparks is made to cross a mixture of acetylene, C_2H_2, and nitrogen. (2) Cyanide of ammonium is formed when ammonia is passed over red-hot charcoal (see *supra*). (3) Metallic cyanides are produced when dry nitrogen gas is passed over a dry mixture of carbonate of potash or baryta and charcoal at a white heat. A similar reaction goes on spontaneously in the iron-smelting furnaces and gives rise to the formation of vapour of cyanide of potassium. (4) Sulphocyanide of ammonium is produced from bisulphide of carbon and ammonia, as explained above.

SPORTING GOODS STORE SLINGSHOT IS LETHAL

A new weapon adopted by Militants is the "Whamo" sling shot. Its steel pellets will penetrate a human skull. It can even deliver many types of bombs.

Its arrow attachment allows a Militant to sit in a car and fire an arrow with enough force to kill. While spectators are looking for a man with a bow, the killer drives away. A perfect night weapon.

SINKER BASHER

While at the sporting goods store you might pick up a two-ounce lead fishing sinker. Tie on two feet of strong fish line and make a loop at the end.

To use it, put the loop on your forefinger and hold the sinker and line in the palm of your hand. Then half throw, half swing the sinker at the prey.

With a little practice you can flick it out at a victim's temple and finish him off before he knows you mean to strike. This goody is for close quarter work in crowds, especially at night. They drop like flies and no one knows what hit him.

PLASTIC AUTO BODY FILLER FOR BETTER BOMBS

A plastic substance used to fill out dents in car bodies can also be used to compact simple bombs and replace the screw caps on pipe bombs.

Some of the substance is put on a piece of wood or cardboard. Then a few drops of hardener are added and the stuff is well mixed. It begins to harden in a few minutes so you have to have all your job ready and work fast before the ooky mess gets too stiff to work with.

It sets in a few minutes and then any excess can be pared off with a knife before it gets too hard. It is like rock in 24 hours. In the first few minutes it is sticky and runs, so often molds are used.

A good use for plastic auto body filler is to stop up the ends of pipe bombs. Pipe caps are very expensive and the Militant must be constantly on the alert for ways to cut corners; as who does not in these days of ruinous inflation?

An inch of the filler is enough to cap the ends. Since the glop is sticky and runs, paper wadding is put in the end of the pipe to hold the filler in place until it hardens. The wadding is then removed or packed against the filler with a stick.

First, the wadding is shoved into the pipe so there is a one-inch space. The space is filled with goody which is allowed to harden. Then you remove all the wadding you can or pack it in. Then fill the pipe with explosive to 1½ inches from the top.

Then a fuse is put into the explosive and a small bit of wadding is pressed around it. The filler is poured in and the thing is done.

In order to save a hassle in getting the first batch of wadding out there should be two pieces of wadding. A big gob of wadding should be put in first and a small gob should be put over it. That way, the little gob will be stuck to the filler and the big gob can be removed without trouble.

The chemicals in some brands of auto body filler will deactivate some brands of fuse. If this happens with yours, just twist some plastic from a Baggie around the fuse that will be exposed to the filler.

This method of capping pipe bombs saves more than the price of the caps. It also allows you to use scrap pipe cut to size instead of the more expensive lengths of pipe that are threaded for caps.

Anything you are using the filler on should be free from grease and dirt. Pipes should be boiled in strong soap so the filler will bond with the metal.

As the filler begins to set it becomes quite hot. There is not enough heat to detonate any explosive, but for safety's sake, always use some wadding.

PEOPLE'S GRENADES

A very simple way to make a grenade is to fill a two-ounce bottle with gunpowder or other explosive. The bottle cap is drilled for a fuse. The bottle and part of the fuse is then smeared liberally with plastic auto body filler and laid on a waxed or paper surface and allowed to harden.

THE ULTIMATE BOOBY TRAP

or

Ammonium Nitrogen Tri-Iodide

Every reference I've read concerning ammonium nitrogen tri-iodide has it as an interesting scientific curiosity with no practical application. "ANTI", as I call it; being anti any enemy, is guaranteed to be the most effective booby trap trigger ever discovered.

I got the formula from "Chemical Magic", one of the books in GRANDDAD'S WONDERFUL BOOK OF CHEMISTRY. ANTI is simply iodine crystals soaked in strong ammonia. The book advises making up just a little bit and demonstrating how it can be set off by the touch of a feather. You see, it is an explosive. In fact, it's a high explosive; a fulminate!

The reason other writers have dismissed it as having no practical application is probably because they don't think along the lines of improvised weaponry. But I do. I made about a teaspoonful and spread it about an eighth of an inch thick on my work table and let it dry. Then I barely touched it with a feather. Instead of the snap-crackle-pop effect described in the book, it was a real explosion. The table was pitted and my ears rang. After having made far more than required to demonstrate this amazingly unstable substance, I was struck by its heretofore unmentioned potential as a weapon.

Imagine a high explosive anyone can make and which is harmless while moist but devastating when dry. Say you put a moist piece about the size of a grain of rice into a pipe bomb three fourths full of powder and then screw on the cap. When its moisture diffuses throughout the pipe, in about an hour, it is dry and any vibration will cause it to explode, thereby igniting the powder. Crushed into a paste, a dollop about the size of a bean on a stick of dynamite, once dry will explode the dynamite at the slightest vibration. Such a pipe bomb or stick of dynamite under the car seat of an enemy would have him out of the way an hour down the road. I'm sure you can think of many other ways to use it.

To make it, all you need is iodine crystals and strong ammonia. You can get both from most pharmacies located near hospitals. I would advise against asking for both at the same place.

If your pharmacist doesn't stock iodine crystals he can order them for you at about $12.00 for four ounces. You might tell him you are thinking of making up some first aid kits and want to make your own tincture of iodine. Four ounces is enough to last you a lifetime.

The strong ammonia can be gotten under the pretense of being a butterfly and moth collector. Ammonia in bottles with some cotton on the bottom kills butterflies quickly. The store ammonia is weaker and the soap sticks to the scales so strong ammonia is an absolute necessity.

But if you don't want to bother your pharmacist you can distill your own from store ammonia in the still described further on. Two 28 ounce bottles will provide 14 ounces of strong ammonia, free from the soap and gunk in all household cleaning ammonias.

Anyway, to make ANTI, just drop iodine crystals into ten times their volume of strong ammonia. A few grains will prove the process. After about ten minutes soaking, swirl and pour the iodine crystals into a coffee filter. Then remove the filter from its holder and scrape up the crystals and/or paste with a knife or spatula. Crystals are best for strewing around for people to step or sit on, causing coronaries. Paste is best for spreading on things and also for stability in the rate of drying. A small pile of treated crystals drying would set each other off as they settled. The paste, however, will dry uniformly and will not go off because of its own weight.

When you have put the ANTI on a board or some other surface you don't care about, use the knife or spatula to separate it into tiny bits. After an hour's drying just slightly touch one of the particles with a feather or anything else and you'll get a surprisingly loud explosion, which will most likely set off the rest if the particles are close together.

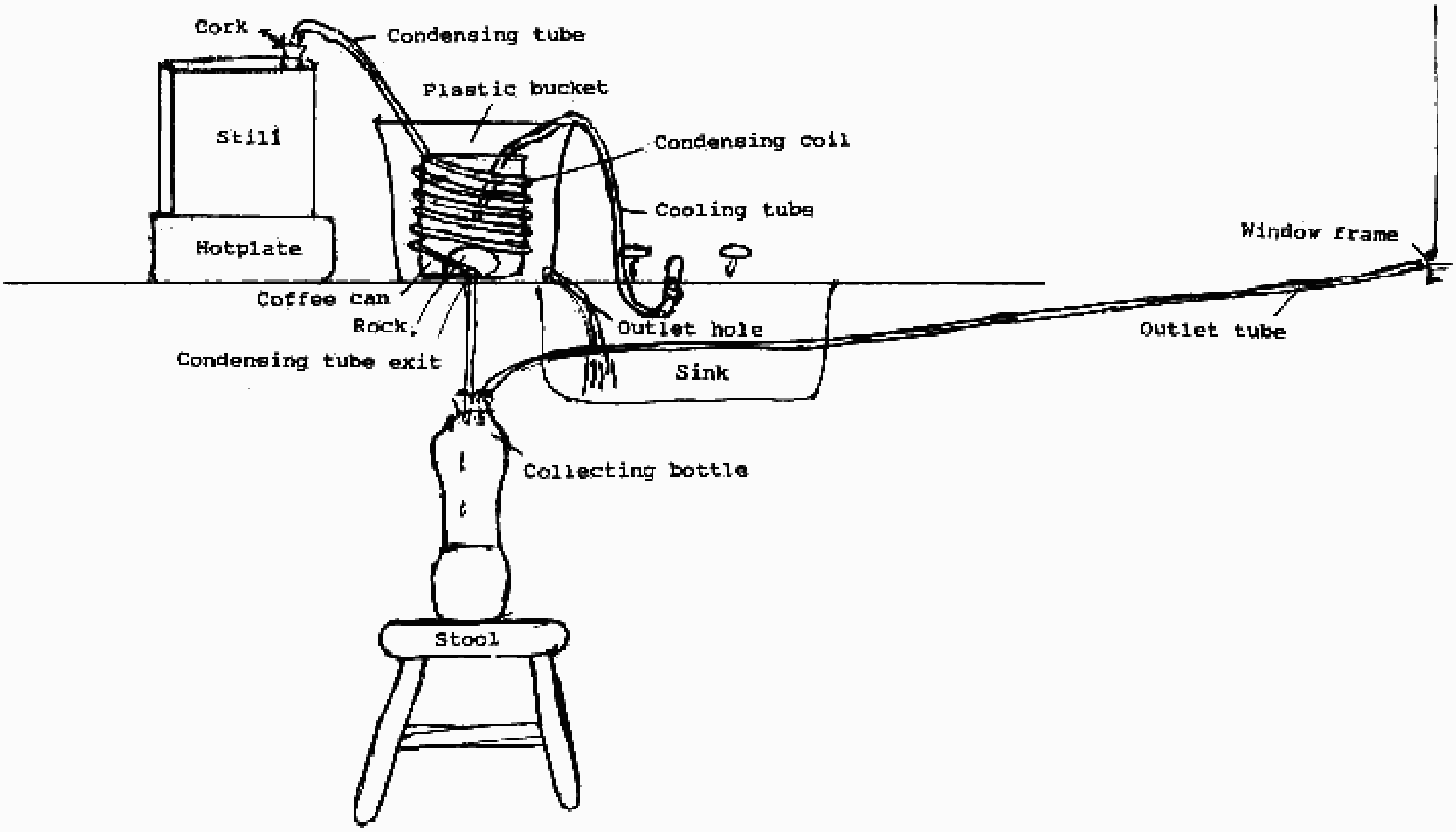
ANTI can be made in a relatively large batch and carried safely. A good way is to cut about a square inch from the corner of a plastic baggy. Put the ANTI in the bottom corner and roll it up. Then wrap it in a wet cloth and roll that up and put it in a whole baggy and roll that up too. The ANTI could stay that way for months and yet be ready for use at any time.

RATAWAY - SIMPLE MINEFIELD GUARANTEED TO RID AREA OF RATS

When a rat eats of poisoned bait, if sickness follows fast enough for him to make the connection, he can somehow communicate to his fellow rats that that food is bad. ANTI has been used to clear an area of rats. The iodine crystals are finely ground so the ANTI is a paste. The paste is dappled around food, near rat holes, along the floor by basement walls and wherever rats are known to run. As the rat sets off the ANTI, either by stepping on it or touching it with a whisker, he will be terrified and will communicate this terror to the other rats. In a couple of days they will all have left. Repeat minings every few weeks will keep any area free of rats.

THE STILL

If you buy a still from a health food store it will cost you about $200.00. But you can make one yourself out of odds and ends and just plain junk for about $7.00 and it will work as well as the expensive one. Also, all its parts can be bought from your local supermarket and hardware store.



All you need is a one-gallon gas or cooking oil can as the still, itself. The cork for the can is available from any hardware store. Then you will need a roll of plastic electrical tape, an 11 quart plastic bucket, picture hanging wire, a three-pound coffee can, a roll of three-quarter inch paper masking tape and about 20 feet of 3/8" outside diameter plastic tubing from the hardware store and some childs' modelling clay.

First, drill a 3/8" hole through the cork. Then drill two 3/8" holes in the side of the bucket at the bottom and a quarter of the distance around from each other. Through one of these holes will run the condenser coil tubing and the other will allow the excess water to squirt into the sink.

Next, take the coffee can and start the masking tape at the top and make five winds evenly down to the bottom. That will leave about an inch of uncovered can between the winds of masking tape. Now you will have the path on which to attach the condensing coil so it winds down evenly so the distillate will flow freely into the collecting container under the tubing coming from the bucket. Then take the smallest drill bit you can buy from the hardware store and drill holes through the masking tape and the can. Start drilling at the top and drill a hole every six inches until you reach the very bottom.

Then cut several three inch lengths of picture hanging wire. Start the tubing about 18 inches from one end, bend a piece of wire over it and put the two ends of the wire into the top hole. Pull the wire ends all the way in and bend them back along the inside of the can. Do the same thing six inches further on and repeat until you have the condenser coil fixed all the way around the can five winds to the bottom.

About three inches from the bottom of the can, wind plastic electrical tape around the condenser tubing maybe four of five turns. Just back toward the can, wind another section of tape maybe eight or nine turns. then begin winding more tape from the thicker part to about an inch beyond the thinner part.

Next, place the condenser coil can in the bucket and push the tubing through the hole in the bucket's side. Pull it through until the taped part clogs the hole. When the bucket is full of water, pull the taped part further until no water leaks out around the tubing.

Now set your hotplate near the kitchen sink with the plastic bucket beside it with the water vent hole just over the sink. Stick the top end of the tubing just through the cork and press modelling clay around it to stop any fumes or steam from leaking out around the tube.

Now pour two 28 ounce bottles of household ammonia into the can and put the cork in tightly. Turn on the hotplate just past MEDIUM and wait until you smell fumes coming from the end of the tube hanging down into the collecting bottle on a stool by the sink and directly under the bucket. Before filling the bucket with water put a rock or other weight inside the can lest the air in the condensing coil tilt it once the can and bucket are filled with water.

Cut off about two feet of the bottom of the tubing and stick an end into the fawcet. Wrap a plastic baggy around the fawcet and the tube. Secure the tube by wrapping plastic tape around the fawcet, the baggy and a bit of the tubing. This will keep the water inside the tubing.

Since you will be dealing with ammonia you won't want to stink up the house. Take your 3/8" drill and make a hole through the frame of the nearest window and stick an end of the spare tubing through it. This will lead any stray fumes outside and when not in use, the hole can be covered with a small bit of tape and should not be noticeable.

When you smell the fumes coming from the end of the condenser tube fill the bucket with cold water and turn on the water fawcet just enough to compensate for the amount of water spurting out from the bottom of the bucket into the sink. You must do this to keep cool water in the bucket, otherwise the water in the bucket would heat up and would not condense the steam and ammonia gas coming from the still.

When the action has started make sure the condensing tube end is in the collecting bottle along with an end of the tubing leading outside. Press modelling clay around the two tubes so no fumes escape into the kitchen. Now you are ready to distil the ammonia.

By the time you've finished setting up the ammonia should be about ready to boil. Actually, ammonia is a gas which has combined with the water. The water has to boil so it will come over with the ammonia. Otherwise, the ammonia will just leave the water and pass through the tube to the outside. But with the water at a good boil, the ammonia will come over with it. When the collecting bottle is half full, stop the process. Take a cautious sniff of the open collecting bottle and you'll notice it is much stronger than the original. Smell what is left in the still and you will see there is hardly any ammonia smell at all. So you have not only condensed the ammonia into one quarter of the original amount of water but you've left the soap and other gunk behind. Wasn't that fun?

You can use the same still to take alcohol from wine, which then makes it brandy. You can also pour in rubbing alcohol, which is 30% water and take out nearly pure alcohol. When working with alcohol you must realize that it boils at 173 degrees F instead of 212 as does water. So when you want alcohol you use a kitchen thermometer stuck in the mouth of the still. When the thermometer registers 173 degrees or slightly higher, put the cork and its tube in the still and turn the heat down slightly so the temperature doesn't rise.

The alcohol should come over in a pretty steady flow if you have the heat adjusted to the point where it is above 173 but below 212. When the flow just about stops you will get nothing further but drops of water, which you don't want so stop the process.

You can make this still in a few hours and it will last indefinitely with minor repairs. Once you've learned to use and adjust it properly to fill your needs, it will be a handy and reliable tool.

FIRE GRENADES

Molotov coctails have a way of being bulky and hard to throw far or accurately. The use of lightbulbs as fire grenades gives you longer range and accuracy. They are simple to prepare and more sturdy than you might realize. Their size also permits one to carry such a weapon in a pants pocket if concealability is a consideration. Their availability is universal ond one who saves his standard light bulbs after they've burned out will have a good supply in a short time.

Using a standard light bulb, pour in four ounces of gasoline. Use no more, since, if the bulb is full, it may not work. Gasoline does not burn; it is only the fumes that burn. Therefore, if you fill the bulb completely, the liquid is apt to put out the flaming cotton fuse. But if you allow for an air space, fumes will be released on impact and the gasoline will work as it is supposed to.

For more sticking effect, you can mix the gasoline with half roofing tar or crank-case oil. Chain-Saw oil increases the burning rate. But, for all intents and purposes, plain gasoline will serve.

To make the fire grenade, first treat the bulb as if you were making a chemistry flask, page 7. Then fill it with the combustible liquid and stuff a piece of cotton into the hole tight enough so it won't fall out but loose enough for the liquid to soak the top part and act as a wick. Tilt the bulb so the wick is saturated and it's ready to light.

If you just have one target, a good carrier is a Campbell Soup can. Put a layer of paper towling in the bottom of the can to act as a cushion. This will enable you to carry the greande in a pants or jacket pocket without fear of its breaking.

AMMONIUM NITRATE

Some Militants who don't have much dynamite use ammonium nitrate. This can be bought by anyone at $3.75 for an 80 pound bag. It is a fertilizer.

Ammonium nitrate explodes at rates up to 14,000 feet per second. It is roughly compared to dynamite having 60% nitro.

The fertilizer grade Militants use is mixed with motor oil at the ratio of one pint of oil to 8½ pounds of ammonium nitrate. This has to be detonated with a stick of gelatin dynamite.

Purified ammonium nitrate can be detonated with a number six dynamite cap. The pure stuff can be bought at chemical supply houses or the fertilizer grade can be purified with distilled wood alcohol.

Put several pounds of fertilizer grade ammonium nitrate in a pan. Pour in enough wood alcohol (methanol) to cover the fertilizer. Then stir it until a lot of it has dissolved. Next, let it set a few minutes to allow the impurities to settle to the bottom along with the undissolved ammonium nitrate.

Another pan is set on some pieces of dry ice for the next step. Dry ice can be found in the business section of the phone book under "Dry Ice." Locker companies will sell it to anyone, cheaply and in small amounts.

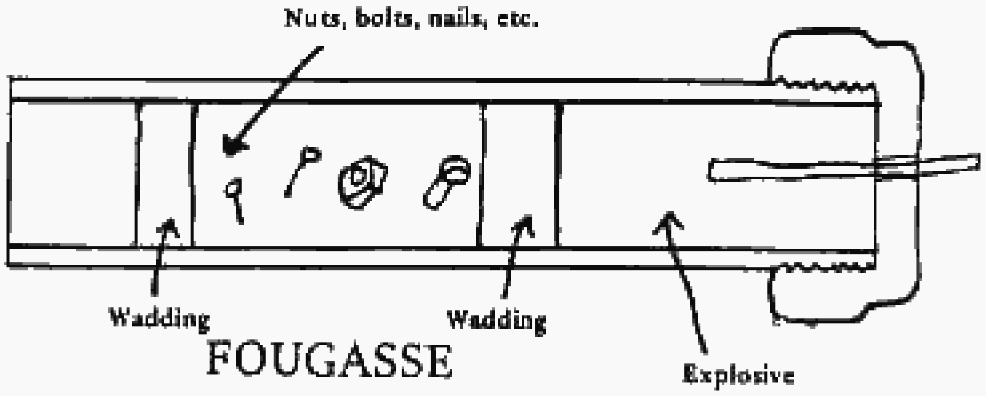
The dissolved ammonium nitrate is poured into the cold pan. This is done carefully so as to leave the impurities and undissolved ammonium nitrate behind.

The dry ice causes the purified ammonium nitrate to precipitate out of the solution in crystals. When no more crystals are formed they are removed from the alcohol.

The alcohol is then poured back into the other pan and stirred to dissolve any ammonium nitrate left undissolved. After setting a few minutes the solution is again poured off the dregs and the dregs are thrown away. When the last batch of crystals is removed, the alcohol can be stored and reused.

The dry ice is simply frozen carbon dioxide and its fumes are harmless unless they are enough to replace the air. Don't handle the dry ice with your bare hands as its cold will cause blisters.

In order for pure ammonium nitrate to be detonated by a dynamite cap, it must be very dry. Spread it out under a heat lamp or in the sun. When completely dry, store it in tightly closed plastic bags.



FOUGASSE

This is like a big shotgun or the old-fashioned blunderbus. It is simply a pipe with a cap on one end drilled for a fuse. It is stuck in a tree or laid down. If you hold it you'll be kicked a mile.

When the fuse is put in, a couple of inches of gunpowder is added. Then some cotton or paper wadding is put in and pressed down gently but firmly.

Next, some nuts and bolts are poured in and some more wadding is tamped in to hold them in place.

The fougasse doesn't have much of a range but it is hell on a crowd or down an alley.

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EXPLOSIVES

INTRODUCTION TO PRIMARY EXPLOSIVES

Explosives are substances which undergo a rapid chemical change to produce large amounts of gases. Since the reaction is exothermic, that is, a reaction which releases heat, the gases are expanded, producing a still more forceful explosion. Explosives are classified as either low explosives or propellants, or high explosives, the difference being in the way they function. Low explosives burn and are set off with a fuse. The explosion results from the bursting of the casing in which they are held.

High explosives detonate, which is a much more rapid chemical change than burning. Although detonation is usually accompanied by a flame, it is not a burning process and some high explosives do not contain oxygen. Under high explosives are two subclasses: primary or initiating, and secondary. Secondary high explosives are set off by shock, this generally being provided by a blasting cap. They are generally much less sensitive and more powerful than primary explosives and, because of these properties, are used as the main blasting charge in most industrial blasting operations.

Primary high explosives will turn an ignition into a detonation, and some primary explosives are used in blasting caps to set off secondary high explosives, hence the name initiating. Primary explosives are much more sensitive than secondary explosives and much more care should be used when working with them. Included in this booklet are the preparations of mercury fulminate, lead azide, and several priming mixtures; these explosives were chosen because they are the most widely used in blasting caps.

Some of the compounds and some of the chemicals used in their preparations are very dangerous. We suggest that you always use the proper safety precautions when working with any chemicals. This booklet is published strictly for educational purposes. Any person making the compounds using the procedures in this booklet should keep in mind that THESE CHEMICALS AND COMPOUNDS ARE DANGEROUS, and the author cannot be held responsible for accidents arising from the preparation of these compounds. Any inexperienced person should seek the guidance of a chemistry teacher or other qualified person before attempting the preparation of these compounds.

MERCURY FULMINATE

In many states there are laws pertaining to the making, storage, and use of explosives. Before attempting to make, use, or store any explosives or dangerous chemicals, you should obtain permission from your state, local, and any other authorities which may have control over them.

Mercury fulminate was the first primary explosive to be used in blasting caps and is still used in fuse-type blasting caps. It is a fairly sensitive primer and is easily detonated by flame or shock.

Mercury fulminate is a white to gray crystalline solid, which is only slightly soluable in water, and is nonhydroscopic.

LEAD AZIDE

Lead azide is a somewhat less sensitive initiator than mercury fulminate and is a much more effective initiator than that explosive. Its chemical formula is Pb $(N_3)_2$. It is made by reacting solutions of lead acetate and sodium azide together, and the reaction is endothermic.

Lead azide is a white crystalline solid, practically insoluable in water, and nonhydroscopic. It detonates at 383°; and, because of this higher detonating temperature, lead azide is not always detonated by the end spit of a safety fuse. In storing, lead azide should be kept cool and away from heat and light.

Preparation of Lead Azide: Six grams of lead acetate is dissolved in 300-ml. of water at 70° in a 400-ml. beaker and is poured into a 600-ml. beaker containing 10 grams of sodium azide dissolved in 200-ml. of water at 50° and stirred. A white solid will immediately form which is filtered and allowed to dry completely. Lead azide should not be stored under water because of its crystallizing properties.

PRIMING MIXTURES

In modern blasting caps, mercury fulminate is mixed with potassium chlorate. This makes the explosive cheaper as well as more powerful. The two most commonly used formulas are 80/20 and 90/10 mixtures of mercury fulminate and potassium chlorate, respectively. The 80/20 mixture has almost completely replaced the others. Potassium perchlorate may be used instead of potassium chlorate in an 85/15 mixture.

One of the main disadvantages of using mercury fulminate as an initiator is its tendency to become dead pressed. Mixing lead azide and mercury fulminate together in a 3 to 1 ratio, respectively, eliminates the possibility of it becoming dead pressed and also insures that the lead azide will detonate from the end spit of a safety fuse. This mixture should never be placed in a copper tubed blasting cap.

THE PREPARATION OF BLASTING CAPS

Blasting caps for the purpose of initiating high explosives, consist of a copper or aluminum tube which is closed at one end and filled with a certain amount of primary explosive and sometimes a booster explosive. The other end is left open to receive the safety fuse which is placed in and crimpted prior to use or, in the case of an electric blasting cap, an ignitor assembly consisting of an ignitor wire which glows red hot when a current in run through it, an ignitor compound to help ignite the primary explosive, a rubber cap which is crimped into place to protect the cap from water, and leg wires which are connected to the main firing line. The tube usually has an inside diameter of 3/16 inch, and the length is determined by the amount of explosive which will be contained in it. Whether the tube is copper or aluminum depends upon the primary explosive to be used. Lead azide should never be used in a blasting cap that has a copper tube for the container. This is because of the formation of copper azide which is a very sensitive explosive. The amount of primary explosive used depends upon the explosive to be detonated. Blasting caps for detonating dynamite contain .5 grams of the 80-20 mixture of mercury fulminate and potassium chlorate. Electric caps are rated by the numbers 6 and 8. A number 6 cap contains .2 grams of the 80/20 mixture and .4 grams of a booster explosive known as pentaerythritoltetranitrate (abbreviated PETN). The purpose of using a booster explosive is to reduce the amount of primary explosive needed in a cap, thereby reducing the dangers involved in handling the caps since it would be less likely to be set off from accidental shock. Booster explosives are secondary class high explosives but are more sensitive than the ones used in the main blasting charge. A number 8 cap is twice as powerful as a number 6 and, of course, is used for setting off less sensitive explosives such as starch nitrate. It contains .2 grams of the 80/20 mixture and .8 grams of pentaerythritoltetranitrate. This cap has approximately the same power as 2 grams of the 80/20 mercury fulminate-potassium chlorate mixture. It might be noted that different explosive companies will use different primary and booster explosives, such as diazodinitrophenol (DDNP), manitol hexanitrate, trinitrophenolmethylnitramine (tetryl) and cyclotrimethylenenitramine (cyclonite) to name a few. The explosives mentioned above are most suited to amateur use and are approximately the same strength as the commercial blasting caps.

A suitable blasting cap for detonating dynamite, which is easily prepared from ordinary materials, consists of an empty 22 shell (the long rifle size) which is filled with the 80/20 mixture. The shell will hold about .4 grams of this mixture which will detonate most dynamites. Fuse for this cap can be easily made by filling an ordinary plastic straw with a 60/40 mixture of potassium nitrate and brown sugar, respectively. Other mixtures, such as 70/30 and 75/25, may also be used. The mixture burns very slowly, but all fuses to be used in connection with explosives should be tested by burning a short length before using. The straw will fit over the shell and masking tape should be wound all the way up the straw. The tape will keep the explosive from being set on fire by the fuse. Usually about two thicknesses of masking tape will prevent this. For larger caps, copper or aluminum tubing can be used. As stated before, the tubing should be 3/16-inch inside diameter and about 1/4-inch outside diameter. It is necessary to experiment to get the right length for the particular amount of primary explosive to be used. Always allow at least 1/2-inch to receive the safety fuse or, if you wish to make your own fuse by the method mentioned above, this distance may be filled with the fuse powder. This will also prevent the primary explosive from falling out until the cap is used. To seal the other end of the cap, the best method is to press wax in it. It is advisable never to crimp this end or any other part of the cap except for receiving the safety fuse (if used). For this type of cap another fuse may also be used which will fit inside the cap. To make it, a small piece of cotton string is coated with a wet mixture of potassium nitrate 75%, charcoal dust 14%, sulfur 9%, and dextrin 2%, by running it through the mixture. This is allowed to dry thoroughly. It is then covered with two thicknesses of masking tape, and the burning rate is tested as before. This is a much faster burning fuse than the one used before and also produces less smoke. To secure it to the blasting cap, wrap a small piece of tape around both. It is very important to make sure the fuse is seated snugly against the primary explosive.

PRIMING EXPLOSIVES WITH BLASTING CAPS

There are three general methods of attaching the blasting cap into the explosive cartridge and any of them are suitable, provided that the cap is securely held in place inside the cartridge so that it cannot be accidentally pulled from it. In wet conditions, the attachment must be waterproof.

In side priming, a hole is punched in the side of the cartridge and into the explosive so that the cap will be in the center of it. The business end of the cap should be always pointing in the direction of the rest of the cartridges, if any. The business end is the end containing the explosive or opposite the end that receives the fuse. The cap may be held in place by wrapping over the hole with electrician's tape.

Bottom end priming is probably the most satisfactory for getting the most effeciency out of the explosive since it confines all the explosion gasses until the entire charge has detonated. A hole should be placed in the center of the end of the cartridge to a depth that will confine the explosion of the cap into the explosive and will not permit it to merely blow the end off the cartridge. Tape should be placed around the bend in the fuse to hold the cap in the explosive. Since the fuse must be bent sharply back around the cartridge, the plastic straw type fuse cannot be used and care should be taken when using any type of fuse that it is not bent so sharply that it breaks the powder core.

Top end priming is usually the easiest when blasting with fuse-type blasting caps. As in priming with the bottom method, a hole is placed in the center of the end of the cartridge to the proper depth and the cap is placed in it. The fuse is then brought to one side and tied with string or taped across the bottom of the cartridge.

The cheapness and availability of ammonium nitrate has brought into use many cap insensitive explosives, such as ammonium nitrate-fuel oil mixtures. These explosives are too insensitive to be set off by even a number 8 blasting cap. In order to detonate them a booster charge is needed. This consists of a highly brisant cap sensitive explosive such as blasting gelatin or gelatin dynamite. These explosives are placed in the bore hole next to the other explosives and the blasting caps are placed in them.

INTRODUCTION TO HIGH EXPLOSIVES

Explosives are substances which undergo a rapid chemical change to produce large amounts of gasses. Since the reaction is an exothermic one, a reaction which releases heat, the gasses are expanded, producing a still more forceful explosion. Explosives are classified as either low explosives or propellants and high explosives, the difference being in the way they function. Low explosives burn and are set off with a fuse. The explosion results from the bursting of the casing in which they are held.

High explosives detonate, which is a much more rapid chemical change than burning. Although detonation is usually accompanied by a flame, it is not a burning process and a few high explosives do not contain oxygen. Under high explosives are two sub classes: primary, or initiating, and secondary. Primary explosives will turn into a detonation and some primary explosives are used in blasting caps to set off secondary high explosives (hence the name initiating). Examples of these are lead azide and mercury fulminate. Secondary high explosives are set off by shock, this generally being provided by a blasting cap. Nitric esters and the other high explosives discussed in this booklet are secondary high explosives. If you wish to make blasting caps to set them off, see our booklet "The Preparation of Primary Explosives and Blasting Caps" which gives their complete preparations. It might be noted that, although secondary high explosives are generally set off by shock if ignited in sufficiently large quantities and after burning for some time, they may eventually build up enough heat that the explosive will be raised to its detonating temperature and, of course, go off.

High explosives, because of their detonating rates ranging from under 2,000 to 8,100 meters per second, are very brisant. Brisance is defined as the shattering quality in an explosive. This quality is wanted when the explosive is being used in blasting hard rock or penetrating armor. The more brisant explosives are pure nitrated organic materials such as cyclonite, trinitrotoluene (TNT), or blasting gelatin. The less brisant ones are explosives such as ammonium nitrate or mixtures of nitrated and non-explosive ingredients such as dynamites. These explosives are used in blasting sand or when a great deal of push-type power is wanted. Gelatin dynamites, the most brisant in this group, are brisant enough to be used in most hard rock or underwater applications. The velocity of these explosives can be varied by the granual size, coarser dynamites being less brisant.

When choosing the right explosive for a particular job, the following properties should be taken into consideration: brisance and heat, necessity of resistance to moisture, sensitivity to impact and heat, thermal and other decompositions. Brisance, as discussed before, would be wanted in hard rock, underwater, and in most military applications, or whenever a shattering effect is desired. An explosive with low brisance would be used in sand or soft rock or in mining operations when large chunks of coal are wanted. Heat in mining operations is not wanted since it could ignite explosive gasses in the mine. Ammonium nitrate dynamites are commonly used or dynamites containing large amounts of a cooling ingredient such as sodium chloride. Such explosives are known as permissables. High heat and high brisance seem to run together and generally when heat producing ingredients, such as aluminum dust, are added, the brisance is increased. Resistance to moisture would be needed in extremely humid regions or under water. Hydroscopic explosives (a hydroscopic substance is one that absorbs moisture from the air), such as ammonium nitrate, could not be used unless protected. Thermal decomposition must be taken into account when using or storing the explosive at high temperatures. Glycerol trinitrate is very sensitive at high temperatures, especially if there is any acid left in it. Most nitrated organic explosives give off fumes when decomposing. When this is noticed, the explosive should be destroyed as it has become extremely sensitive. Sensitivity to impact must be taken into account when the explosive will be subjected to extreme shock as in the case of a shell filler. Obviously dynamites could not be used and instead trinitrotoluene or ammonium picrate may be used.

The first explosives to be discussed will be nitrated organic compounds. Some of these compounds and some of the chemicals used in their preparations are very dangerous. We suggest that you always use the proper safety precautions when working with any chemicals. This booklet is published strictly for educational purposes. Any person making the compounds using the procedures in this booklet should keep in mind that THESE CHEMICALS AND COMPOUNDS ARE DANGEROUS, and the author cannot be held responsible for accidents arising from the preparation of these compounds. Any inexperienced person should seek the guidance of a chemistry teacher or other qualified person before attempting the preparation of these compounds. In many states there are laws pertaining to the making, storage, and use of explosives. Before attempting to make, use, or store any explosives or dangerous chemicals, you should obtain permission from your state, local, and any other authorities which may have control over them.

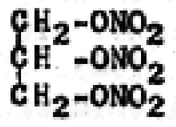
NOTES TO PREPARATIONS

All the nitric esters in this booklet are prepared by adding the organic substance to mixed nitric and sulfuric acids, sometimes called nitrating acid. The acids and organics used in our tests were of reagent grade quality, and we have made no tests to determine how well any other grades would work. Both the acids must be concentrated. The nitric acid should be approximately 69-70% with a specific gravity of 1.42. The sulfuric acid should be approximately 95-98% concentrated with a specific gravity of 1.84. The mixing of the acids and the addition of the organic substances are both exothermic reactions and a cooling system is needed to keep the mixtures from building up too much heat in the course of mixing. The following system may be used in each of the preparations provided the quantity of chemicals is no larger than that described in the preparation; larger quantities will require larger cooling systems. A foil pie pan, about nine inches in diameter and one and one-half inches deep is filled with ice and the space between the ice particles is filled with water. Salt may be placed on the ice, if desired, for greater cooling. The beaker is placed in a hole in the middle of the pan.

When the liquid nitrates are poured into water after their treatment with the acids, the acids should dissolve in the water, the nitrate will collect as a white or clear insoluable liquid at the bottom of the beaker. For filtering glycerol trinitrate, all that is required is a piece of cloth, ethylene glycol dinitrate will sometimes require a piece of filter paper since it is not as dense as the glycerol trinitrate. Starch and cellulose nitrates may be filtered with cloth. Both the cloth and filter paper should be changed after a few filterings. For the neutralization of the acid remaining in the compounds, the following solution should be used: ten grams of sodium carbonate or bicarbonate, sodium carbonate is sometimes referred to as sal soda, is dissolved in 600 ml. of water at 50-70°. All temperatures in this booklet are given in the centigrade scale. This solution is placed in either an 800 or 1000-ml. beaker. The measurement of the water for the solution need not be exact and the graduations on the side of the beaker are exact enough for this purpose.

GLYCEROL TRINITRATE

Glycerol trinitrate is one of the most important industrial explosives because of its use in dynamites and double base powder, the propellant used in guns. Although it is commonly called nitroglycerin, it is, of course an ester of nitric acid, and not a nitro compound. Since this is a scientific publication, the compounds will be referred to by their correct chemical names. Glycerol trinitrate has a specific gravity of 1.60 at 15°. Its chemical formula is $C_3H_5(ONO_2)_3$. Its structural formula is:



$$\begin{array}{l}CH_2\text{-}ONO_2\\ CH\text{-}ONO_2\\ CH_2\text{-}ONO_2\end{array}$$

The equation for its decomposition is:

$$4C_3H_5(ONO_2)_3 - 6N_2\text{-}12CO_2\text{-}10H_2O\text{-}O_2$$

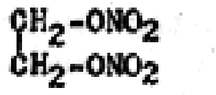
As you can see by the equation, glycerol trinitrate has more than enough oxygen to completely oxidize all of its oxidizable elements. This is called a positive oxygen balance, which accounts for the fact that glycerol trinitrate is one of the most powerful explosives known. It has a detonating rate of approximately 7,700 meters per second.

Glycerol trinitrate is prepared, as are the other nitric esters in this booklet, by the action of nitric and sulfuric acids on whatever organic substance is to be nitrated. The nitric acid is used to impart the ONO_2 group while the sulfuric acid absorbs the water formed in the reaction to keep it from diluting the nitric acid. As explained before, the reaction is strongly exothermic and care must be taken that the temperature does not rise high enough to decompose the compounds. Since the temperature has a direct bearing on yield, it should not be allowed to exceed 25°, whereas 30° is the upper limit. If the temperature rises above 30°, water should be poured into the beaker in which it is being prepared; this is why the beaker is larger than the mixture. If a larger quantity is to be prepared, the chemicals are merely increased proportionately; however, larger mixtures will develop more heat in proportion to larger ones, and this must be taken into account in determining the size of the cooling apparatus. Another point about larger nitration mixtures is that while, if the temperature of a small mixture rises too high and decomposes, it will only boil and produce fumes; whereas, a larger mixture may produce enough to cause the detonation of whatever glycerol trinitrate may have formed. If any mixture, large or small, gets out of hand, pour water into it or leave it immediately. The red fumes formed are nitrogen dioxide which is deadly poisonous, so do not come back into the room until the fumes are gone.

Preparation of Glycerol Trinitrate: Forty-three grams of sulfuric acid and 21 grams of nitric acid are weighed out in a 250-ml. beaker and placed in the cooling system, and the temperature is allowed to drop to 20° or below. Ten grams of glycerine is now added, either through an eyedropper or a separatory funnel, slowly enough that the temperature does not rise above 25°, and preferably stays as far below 25° as is practically possible. When all the glycerin has been added, the mixture is allowed to set for at least 15 minutes more. The mixture is now poured into either an 800 or 1000-ml. beaker containing 600-ml. of water, stirred for a few minutes, then filtered. The glycerol trinitrate is now transferred to a beaker containing the acid neutralization solution, and left for 5 minutes, then filtered again. It is now given a pH test. If acidity shows up, the acid removal process is repeated; if not, it is treated with 500-ml. of water at 50-70° to remove the last traces of alkali. It is now ready to be bottled or used.

ETHYLENE GLYCOL DINITRATE

Ethylene glycol dinitrate is another important nitric ester. It is used in combination with glycerol trinitrate in dynamites to reduce the freezing point of the latter compound, usually in about an 80-20 mixture respectively. This mixture may be used in place of glycerol trinitrate in the dynamite formulas given later. Ethylene glycol dinitrate is commonly abbreviated EGDN and it is often referred to as nitroglycol or glycol dinitrate, both in error. Ethylene glycol dinitrate has a specific gravity of 1.496 at 15°. Its chemical formula is $C_2H_4(ONO_2)_2$. Its structural formula is:



$$\begin{array}{l}CH_2\text{-}ONO_2\\ CH_2\text{-}ONO_2\end{array}$$

The equation for its decomposition is:

$$C_2H_4(ONO_2)_2\text{-}2CO_2\text{-}2H_2O\text{-}N_2$$

As you can see by the equation, ethylene glycol dinitrate has a neutral oxygen balance; that is, it contains the exact amount of oxygen needed to oxidize its carbon and hydrogen. Ethylene glycol dinitrate, as does glycerol trinitrate, gives headaches to persons who breathe its vapors or absorb it through the skin. Headaches caused by ethylene glycol dinitrate are acquired faster and are more violent, but shorter in duration than those caused by glycerol trinitrate. It should be noted that ethylene glycol dinitrate is much more poisonous than glycerol trinitrate, and gloves should always be worn when working with it.

Ethylene glycol dinitrate is made in the usual manner of adding the organic substance to nitrating acid. The reaction in this case is much more exothermic than between glycerin and the acid; and, of course, the ethylene glycol should be added much slower.

Preparation of Ethylene Glycol Dinitrate: Forty grams of sulfuric acid and 22 grams of nitric acid are weighed out in a 250-ml. beaker and are placed in the cooling system. After the temperature has dropped to 20° or lower, 10 grams of ethylene glycol is added. This is done slowly enough that the temperature does not rise above 25°. The mixture is allowed to set for at least 15 minutes after all the ethylene glycol has been added. The mixture is now poured into a beaker containing 600-ml. of water and is stirred for a short time, then filtered. The nitrate is now transferred to a beaker containing the acid neutralization where it is left for 5 minutes. After filtering, the compound should be given a pH test. If acid shows up, the compound is washed in another solution; if not, it is washed in 600-ml. of water at 50-70° to remove the alkali. This washing should be continued for 5 minutes after which it is used or bottled.

CELLULOSE NITRATE

Cellulose nitrate is another very important nitric ester. It is used in double and single base powders and in blasting gelatin and gelatin dynamites. Since the correct formula for cellulose is not known, it is not known how many nitrate radicals a single molecule of cellulose nitrate contains, so the name of cellulose nitrate is not chemically correct; however, since the correct name for it is not known, cellulose nitrate is generally accepted. It is sometimes erronously called nitrocellulose. Cellulose nitrate is rated by the per cent of nitrogen it contains, 14.14 being the highest possible nitrogen content for cellulose nitrate, theoretically.

In the preparation of cellulose nitrate, not too much heat is liberated when the cellulose is added to the acids; and, since the quantity of cellulose in this preparation is small, it may be added all at once.

Preparation of Cellulose Nitrate: Thirty grams of sulfuric acid and 15 grams of nitric acid, which has been diluted with 1 gram of distilled water, are weighed in a 250-ml. beaker. It is now placed in the cooling system and cooled to 25°. One gram of cellulose (cotton) is now added to the acids. This is allowed to set for one hour. The cellulose nitrate and acid are poured into a beaker containing 600-ml. of water. This is stirred for a short while, then filtered. The cellulose nitrate is then heated at 80° for 4 minutes in 600-ml. of water. If a pH test shows acidity, the process is repeated; if not, the excess water is pressed out and the cellulose nitrate is spread out to dry completely. It is now ready to be used.

STARCH NITRATE

Starch nitrate was used in the first world war in hand grenades because of a shortage of toluene which is necessary to produce trinitrotoluene. Starch nitrate may be detonated by a number 8 blasting cap and as is obvious, starch nitrate is rather insensitive to detonation in comparison with the other explosives in this booklet. Starch nitrate is commonly, but erronously, called nitrostarch. It is not a devinate single compound but a mixture of starch nitrates of different degrees of nitration. Starch nitrate is rated, as is cellulose nitrate, by nitrogen content; 12.5 being a good nitrogen content for starch nitrate. To make a larger quantity of the compound is easily done since the addition of starch does not cause the temperature to rise much.

Preparation of Starch Nitrate: Forty-eight grams of sulfuric acid and 25 grams of nitric acid are mixed in a 250-ml. beaker and placed in the cooling system. After the acid mixture has reached a temperature of 20° or lower, 10 grams of starch is slowly added, not allowing the temperature to rise above 25°. After all the starch has been added, the mixture is allowed to set for 30 minutes. The mixture is now poured into a beaker containing 600-ml. of cold water, and stirred for several minutes. The solution is now filtered and the starch nitrate is placed in the acid neutralization solution and left for 5 minutes. After filtering, the compound is given a pH test and either treated again for acid or placed in 600-ml. of water at 40-60° for removal of alkali. It is very important that the compound is ridded of the last traces of acid for it to perform properly. The compound is now spread out to dry completely, after which time it is ready to be used.

STRAIGHT DYNAMITES

Group I

Glycerol Trinitrate	20	25	30	40	45	50	60	75
Sodium Nitrate	70	50	62	45	5	30	20	
Wood Meal	10	25	8	5		20	20	
Starch					50			
Kieselguhr								25

Group II

Glycerol Trinitrate	20	23	25	30	40	50	56	60
Potassium Nitrate	70	41	47	61	43	23	20	15
Wood Meal	10	36	8	9	17	27	4	25
Aluminum dust							20	
Sodium Chloride			20					

DYNAMITES

Dynamite was the first high explosive used for blasting and is still the main high explosive for commercial purposes.

The first dynamite, made by Alfred B. Nobel, was a combination of glycerol trinitrate and keiselguhr, a variety of diatomascious earth, as a desensitizer. This composition is shown in Group I. This dynamite, called guhr dynamite, has what is known as an inert base. That is, the absorbent, keiselguhr, does not chemically change when the dynamite is detonated, which means that the dynamite is not too powerful. The other dynamites contain active bases which consist of wood meal as an absorbent, fuel, and an oxidizer to oxidize it. The strength of a dynamite is rated by the total percentage of glycerol trinitrate in the dynamite. Group II contains potassium nitrate as an oxidizer, which is less hydroscopic than sodium nitrate that is used in Group I. The properties of the additives, sodium chloride and aluminum dust, as explained before, are to reduce or increase brisance and heat.

BLASTING GELATIN AND GELATIN DYNAMITES

Glycerol Trinitrate	93	92	37	47	56	56	65	75
Cellulose Nitrate	7	8	3	3	4	4	5	5
Potassium Nitrate			48	40	30		22	
Sodium Nitrate						32		16
Wood Meal			12	10	10	8	8	4

The invention of blasting gelatin led to a new series of dynamites called gelatin dynamites. Blasting gelatin, as shown by the above compositions, consists of glycerol trinitrate that has been colloided with 7-8% of cellulose nitrate. It is rated at 100% strength and is the most powerful industrial explosive in use. It is also the most brisant and most water resistant. It has a velocity of 7,800 meters per second at d. 1.63. The substitution of blasting gelatin for glycerol trinitrate in dynamites gives a series of gelatin dynamites which, like blasting gelatin, have the properties of being brisant, water proof, and powerful. Both are excellent for underwater work.

AMMONIA AND SEMI-GELATIN DYNAMITES

Glycerol Trinitrate	10	10	20	33	10	25	30	75
Cellulose Nitrate					1	1	1	5
Ammonium Nitrate	70	83	75	30	59	64	30	15
Potassium Nitrate				27			30	
Wood Meal	10	7	5	10	15	10	9	5
Sodium Nitrate	10							

The above compositions make use of ammonium nitrate for an oxidizer. It is interesting to note the added power ammonium nitrate imparts to these compositions. For example, a straight dynamite requires 60% glycerol trinitrate to have a 60% power; however, ammonia dynamites require as little as 20% to have the same power. Ammonia dynamites are very cool explosives with limited brisance which produce small volumes of obnoxious fumes upon detonation, commending their use in underground work, such as tunneling. Ammonium nitrate is very hydroscopic and must be protected from moisture. Because of its detonation properties, the best effeciency can only be obtained in large diameter casings. The ammonium nitrate version of gelatin dynamites is called semi-gelatin dynamites as shown in the last four compositions. Its brisance and water resistance are improved somewhat and, like ammonia dynamites, it produces small volumes of obnoxious fumes. They are sometimes used as a booster for setting off less sensitive ammonium nitrate explosives.

STARCH NITRATE EXPLOSIVES AND GRENITE

Starch Nitrate	23	24	25	27	95	96	97	98
Ammonium Nitrate	35	35	40	30				
Sodium Nitrate	37	32	28	40				
Charcoal dust	4	5	4	2				
Fuel Oil	1	2	2	1	3	2	2	1
Diphenolamine		2	1					
Gum Arabic					2	2	1	1

The above explosives use starch nitrate as a sensitizer and, as explained before, starch nitrate is rather insensitive to detonation; therefore, the explosives derrived from it are not. The purpose of the liquid hydrocarbon additives (fuel oil and xylene) is to protect the mixture from moisture, especially in the mixtures containing ammonium nitrate. The last four mixtures are called grenite, used in hand grenades.